Products finishing

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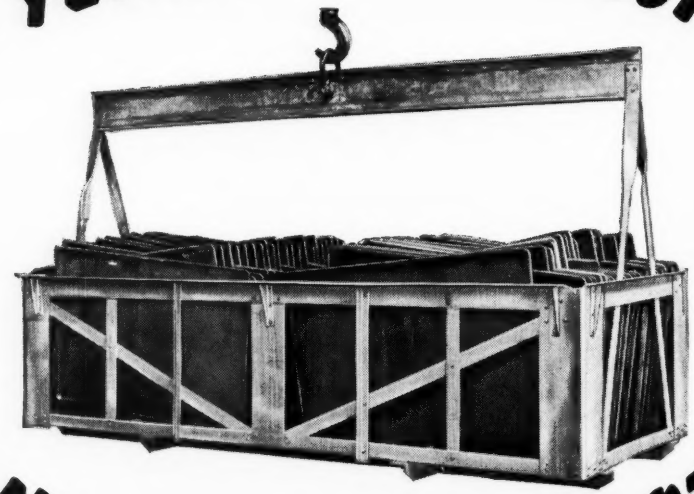

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PRODUCTS finishing

CINCINNATI, OHIO VOL. 4, NO. 8

MAY, 1940

HIGH SPEED FINISHING FOR DOMESTIC WASHERS AND IRONERS

Here is a production finishing set-up that has enabled a washer and ironer manufacturer to become a leader in the field.

By F. K. MUELLER
Factory Manager, Conlon Corporation

WHEN the Conlon Corporation, Cicero, Illinois, began the manufacture of domestic washing machines twenty-five years ago there was no pressure of high-speed production demands to contend with. Production of washers fine enough and in sufficient quantity to satisfy the market was merely a matter of plant capacity, man-power, and human skill. Machines were assembled fast enough but finishing them to withstand the abuse of rough usage with no sacrifice of beauty, seemed to be a time-consuming job with no possibility of maintaining maximum quality and quantity at high speed.

Fifteen years ago, with their advent into the manufacture of household ironers, it became apparent to this company that some way had to be found to hasten the finishing time. The answer was found when the finishing department and engineering staff coordinated their efforts to consider the problem together.

As a result of their research, the former finishing room now operates on a continuous-motion production basis that moves a washer or cabinet ironer from the assembly room to the shipping department in less than two

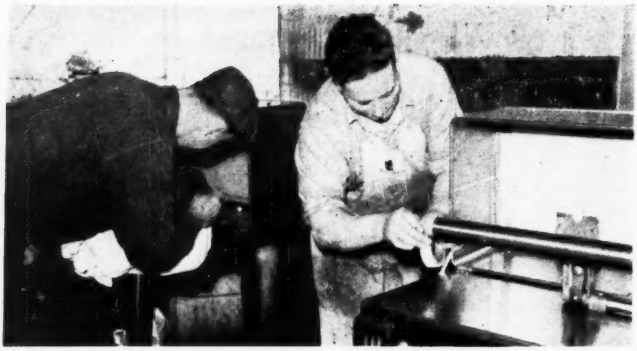

Fig. 1—Last step before finishing, showing the assembled ironers being M.ta.-prepped. The operator on the right is placing masking tape on parts in order to protect and maintain the chrome finish.

hours. Though the plant is not large, a daily capacity of 350 to 400 machines is not unusual. Yet, the quality and uniformity of finish achieved is one of the reasons why Conlon washers and ironers are among the leaders in their field.

The first problem, of course, was to discover a finish that would lend itself to speed finishing. Literally hundreds were tested for durability, ease of handling, retention of color and resistance to alkalies and sulphur dioxide.

Finally, one was located that met all their demands and, in addition, permitted a one-coat finish job of great serviceability. The finish that was selected is marketed under the trade name of Polymerin by the Ault and Wiborg Corporation. It is a finish that sets dust-free with the speed of a lacquer, has the productive characteristics of synthetic finishes and a remarkably short curing time that makes production-line methods possible in the finishing room. Producing a beautiful white that will not chip nor mar or turn yellow with age, the finish is actually the nearest to vitreous enamel of anything found so far.

With the right finish selected, the engineering staff went to work to develop a production system capable of utilizing all the advantages made

Fig. 2 — Spray-painting an ironer unit in one of the booths. The hydraulic table on which the ironer is located has just been raised to make the sides and underpart easily accessible to the spray.

possible by their selection. This was accomplished by installing a constant-motion conveyor and synchronizing the operations of the finishing room to its motion.

All parts used in the assembly of the washers and ironers are cleaned in an automatic degreasing machine. Then, before the assembled product goes to the finishing department, it is coated with Metalprep to remove any grease or dirt that might have been accidentally rubbed on the work during the assembling operations. This process not only cleans the machine but also etches the metal, thus making it more receptive to the paint. The workman shown at the left in Fig. 1 is applying the Metalprep solution to the work. This is the final operation in the assembly line before the machines are masked and wheeled into the finishing department. The workman shown at the right in Fig. 1 is masking plated parts to protect them from being coated with the Polymerin finish.

In the finishing department, the workpieces are once more tack-ragged to make sure no dust remains. It is emphasis on absolute cleanliness that insures smooth, continuous operation through the finishing department with no hold-ups.

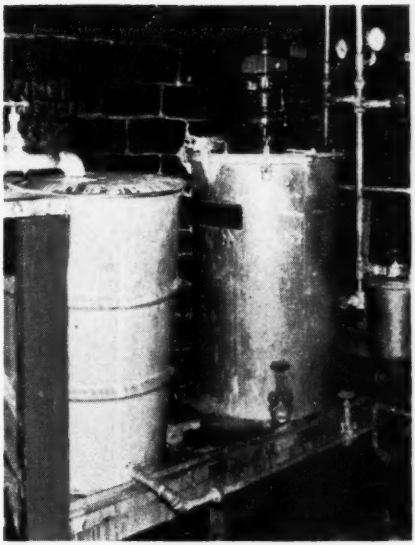

Fig. 3—Central finishing material feed source for spray booths. Paint for all booths is mixed in the left-hand tank. Air pressure to all guns is delivered from the tank on the right.

The Polymerin is applied to the work in a row of modern spray

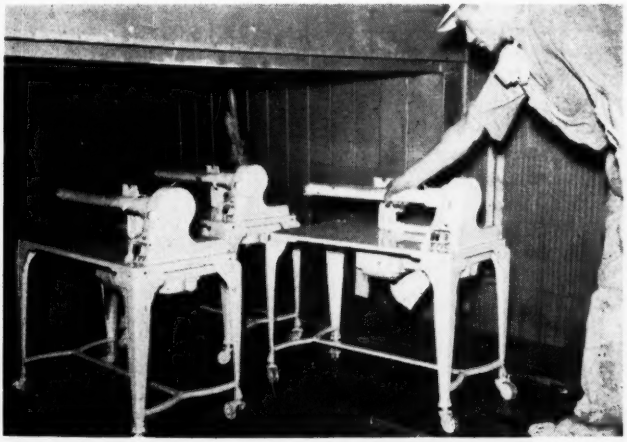

Fig. 4 — Illustration showing the manner in which the finished ironers are placed on the conveyor belt at entrance to the oven. Although temperature is 280 deg. just inside the entrance, high-velocity air screen keeps all heat inside while entrance and exit are left wide open throughout daily operation.

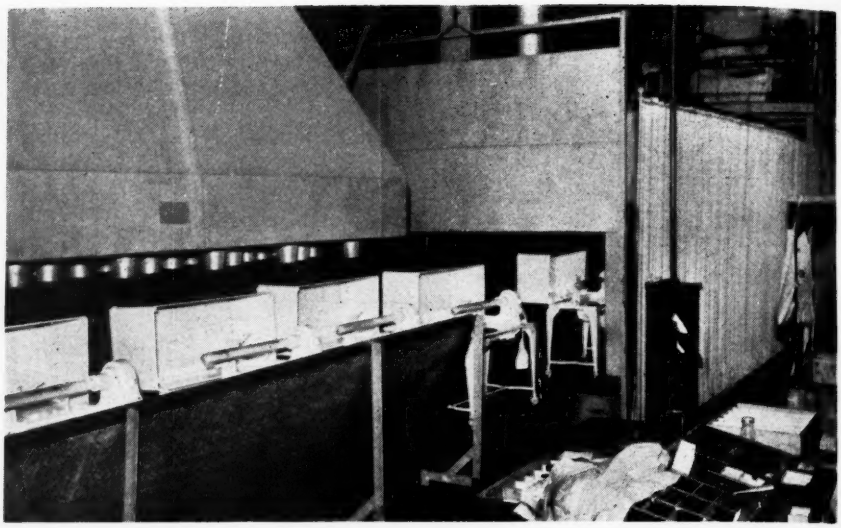

Fig. 5—After fifty-five minutes of baking, the ironers come out of the oven and pass directly under a cooling hood.

booths as shown in Fig. 2 which are equipped with exhaust stacks to draw off fumes. Because of the importance of color uniformity, paint is mixed for all booths at a central source and fed, along with air pressure, to all booths alike. A view of the finishing material mixing room is shown in Fig. 3. The entire day's operations remain under constant control with the assurance of no possible variations in color or depth of finish. The painting department is kept under constant static pressure to eliminate the danger of dust in the air and for added protection, the entire room is scrubbed from top to bottom once a week. The floor is then wiped with a suitable light-viscosity oil.

In applying the finish, there is no pause in the operations. Pneumatic lifts in the floor of each booth quickly move the machine to the proper height and position. A fine coat of finish is sprayed on and without pause, the final heavier coat is sprayed over this base. The machine is then ready for baking.

The constant-motion conveyor starts at the entrance to the oven as shown in Fig. 4. Machines are wheeled from the spray booths up an incline onto this conveyor on rough casters which were placed on each unit during assembly. From this point, the remainder of the finishing operation is automatic.

The baking oven is of the latest type, gas heated and indirect fired, supplying a million BTU and equipped with electric controls to maintain constant temperature over its entire cubical area. The oven is painted inside with aluminum paint to increase heating efficiency and make it easier to clean. Here, too, cleanliness is important. The entire oven is vacuum cleaned and wiped at least once a week.

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To make possible a constant flow of machines in and out, the oven is equipped with Air Seals instead of doors. High pressure blowers recirculate the heated air inside the oven and throw it across entrance and exit ends at high speed. The screen of air is 100 per cent efficient, insuring no heat loss throughout an entire day's operation.

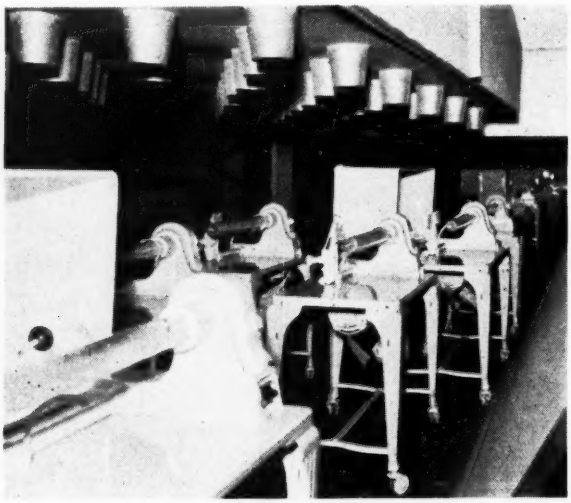

Fig. 6—A view showing the conveyor under the cooling hood and the oven. Ironers are in constant motion throughout the entire lengh of oven and cooler.

The conveyor, an automatic slab-type, carries the machines the length of the oven in fifty-five minutes of constant motion so that there are always wet finishes going in and dry ones coming out. The speed of the conveyor can be varied but for normal operation, fifty-five minutes with the oven at 280 deg. completes the baking. The oven capacity is forty washers or cabinet ironers at a time.

Machines from the oven are too hot to be handled and this presented one of the major handicaps to speed production. Additional cooling time was required and an accompanying need for storage space and extra handling operations.

To defeat this obstacle, a cooling system was installed just beyond the oven exit and directly over the constant-motion conveyor. A view of this cooling system can be seen in Fig. 5. A special booth on the plant roof contains a miniature air conditioning system that screens out all dust and particles from in-drawn air. In summer, spraying water over screens results in a marked temperature drop.

This clean, cool air is drawn by blower down into the finishing room and projected through ducts at high pressure that practically forces the heat from the machines passing beneath the cooling hood. At normal conveyor speed, it takes each machine five minutes to pass through this cooling blast and by the time they reach the end they are cool enough to be comfortably handled. Two closeup views of the machines passing beneath the cooling unit are shown in Figs. 6 and 7.

The finishing operation is complete at this point. Here an operator slips off the rough casters and sets each machine on a wood frame base. Two pegs at opposite corners of the frame fit into caster holes in the legs to produce a tight union of machine and frame. The machines then travel on this flat base around a manual roller-type conveyor for the final opera-

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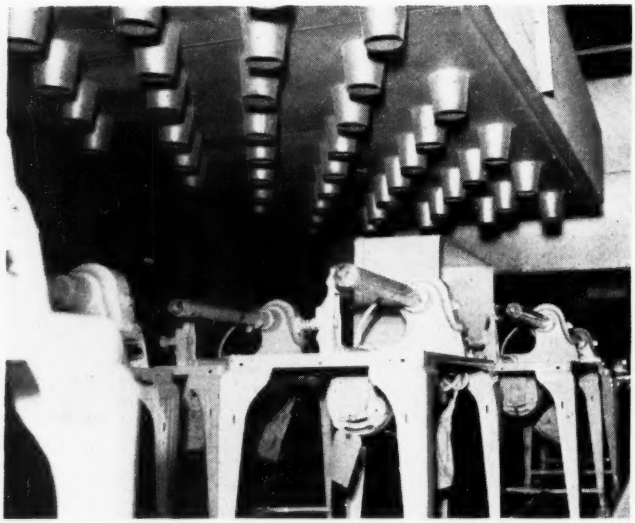

Fig. 7—An underside view of the cooling hood. The pipes are ducts through which clean, cooled air is blown at high pressure over the freshly-baked machines.

tions of removing masking tape, attaching the parts and preparing them in their finished form. The end of this conveyor lies in an inspection booth where they receive final okeh or rejection. From there, less than two hours since they left the assembly room, the washers or ironers are ready for delivery.

Naturally this production line system costs money to install but resulting profits have long ago offset this investment. The fact that today Conlon washers and ironers are among the leaders in the home appliance field is due in no small measure to this production system.

"Heat It Electrically With Chromalox." This is the title of a 64-page catalog that is now being issued by Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh, Pa. The catalog is planned and arranged to help the reader find without delay the detailed information necessary when using electric heat.

Many types of electric heating units in hundreds of various sizes are illustrated and described. Each type has been developed to meet certain heat requirements.

This catalog covers a part of the many different types of Chromalox electric heating units and equipment and is said to be the most complete line of products available for heating applications up to 1,000 degs. F. Engineering data such as installation instructions, suggestions, and drawings show exactly how heaters can be installed. There are information tables and charts which aid in the selection of the type, size, and rating of heaters. Copy free.

Pemco Neopake Frit. A bulletin describing a new opake enamel to be known as Pemco Neopake Frit is now being issued by The Porcelain Enamel & Mfg. Co., Pemco and Eastern Aves., Baltimore, Md. Among the features of this new enamel are one coat application, wide burning range, minimum material consumption, and elimination of black specking and blistering.

A copy of this bulletin will be sent free upon request.

Paint Progress No. 2. The second issue of Paint Progress is now being issued by The New Jersey Zinc Co., 160 Front St., New York, N. Y. This issue contains paint engineering data which will be of interest to metal department executives.

A copy of this bulletin will be sent free upon request.

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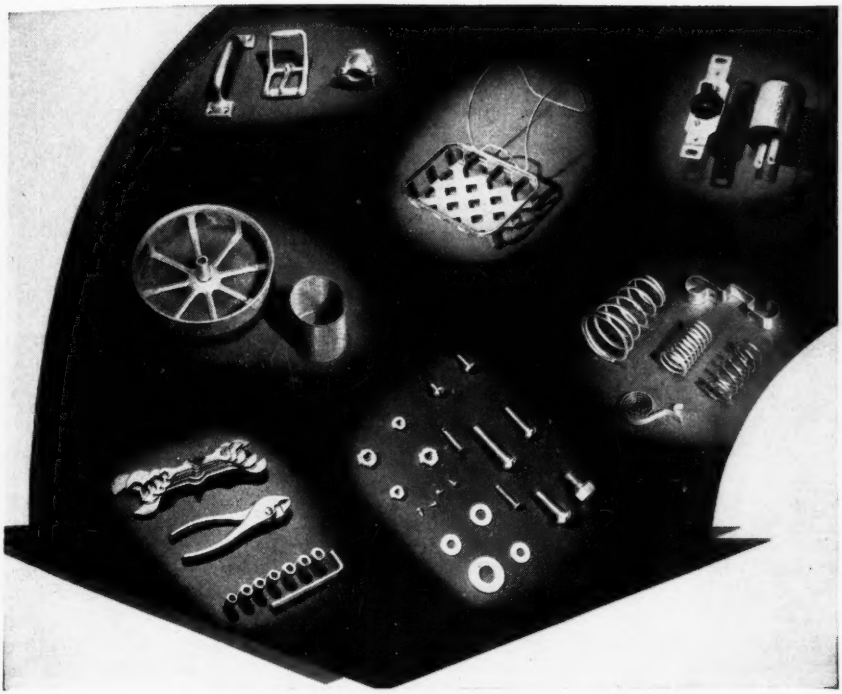

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MODERN EQUIPMENT SOLVES SCIENTIFIC INSTRUMENT FINISHING PROBLEM

Metal finishing operations in one of the most modern manufacturing structures in this country are described herewith.

By J. T. Rooney

Chief Chemist, Spencer Lens Co., Buffalo, New York

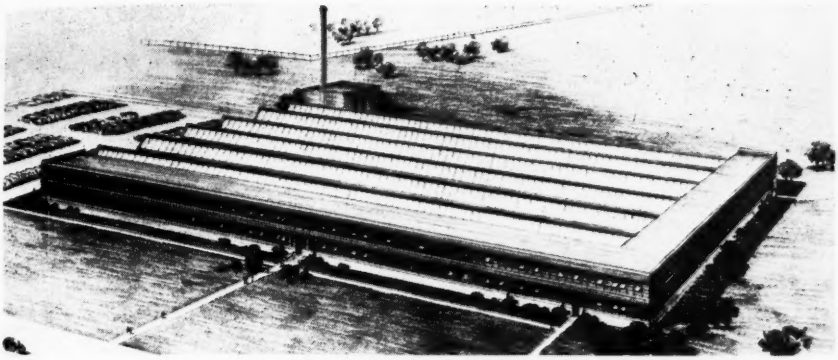
THE finishes which are applied to a single scientific instrument result in almost infinite variety when multiplied by the many types of instruments made by the Spencer Lens Company, Buffalo, N. Y. Beyond variety lies the severe conditions of usage to which almost every scientific instrument is exposed.

Exposure to laboratory fumes, frequent contact with solvents, and almost continuous handling, create special problems in finishing. Gloss, eggshell, and wrinkle enamels are extensively used, however, baking enamels of synthetic resin base are favored for resistance to the action of solvents. Black is the predominating color for optical goods although others, particularly greys and bronzes, are occasionally employed.

The electroplating of instrument parts must necessarily be of the highest order to insure permanence of appearance and protection from abrasion and corrosion. Copper, nickel, chromium, gold, and rhodium are plated regularly in production. Black finishes are obtained by electrolytic and by immersion processes. Aluminum base metal is given plain and colored finishes with mineral-pigmented black predominating because of its hardness, permanence, and beauty.

The plating department of the Spencer Lens Company is spacious and is well ventilated. The concrete floor pitches from two opposite sides toward a central drain trench. A level duckboard flooring of 2-in. cypress and fastened with copper nails is located between the tanks. The concrete floor is covered with layered acid resisting asphalt and all tanks are set up to a common plane so that the tops extend 30 in. above the duckboards. The generators supplying the current for the plating operations are located in a separate room at one end of the department where they are free from corrosive agents. A special storage room is provided for chemicals.

The main sequence of plating operations is as follows:



View of Spencer Lens Company Plant

Degrease—Electroclean as Cathode — Electroclean as Anode — Rinse—Rinse—Cathode clean in cyanide—Rinse—Rinse—Acid Dip —Rinse—Nickel plate—Rinse — Rinse — Chrome plate — Rinse — Rinse—Dry.

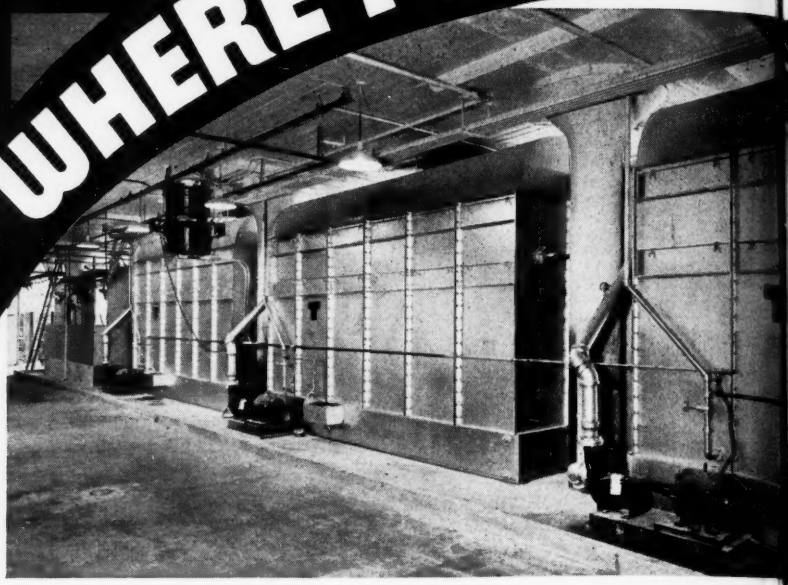
A separate cleaning line is provided to prepare work for the finishing plate when grain finishing or buffing is required following nickel plating. An alkaline cathodic cleaner is used in this instance and this is sometimes followed by cathodic cyanide cleaning, preparatory to chromium plating.

A Detroit Rex 2-stage machine is used for degreasing. Welded steel tanks are provided for all solutions and rinses; nickel plating tanks are rubber lined and an acid-proof brick lining is installed in the chromium tank. For temperature control of the solutions, Fulton - Sylphon Co. and Minneapolis - Honeywell regulators are used. The anodizing tank for aluminum is equipped with a 3-ton Frigidaire cooling unit as well as steam coils to maintain constant temperatures under all weather conditions. Heavy expanded metal, of the type used for concrete reinforcement, nickel-plated, are used as electrodes for the cleaning tanks. Nickel solutions are heated with the aid of pure nickel coils inside the tanks, or Duriron heat exchangers for external heating. Industrial Filter and Pump Company tank filters are employed for keeping the solutions free from sediment. In the aluminum finishing line, tanks are lined with lead, monel metal or aluminum; an absorption tower is included for periodic preparation of fresh sulphide solutions for mineral pigmenting. Many of the tanks in the plating department are separately vented and the atmosphere throughout the department is remarkably free from fumes or vapors.

Nickel solutions include b l a c k nickel, gray nickel, Harshaw bright nickel, and H-VW-M 9H cobalt nickel. The Alcoa Alumilite processes for anodizing, dye coloring and mineral pigmenting are used. The rhodium plating process is that of Baker and Company, Incorporated.

Saltspray cabinets are used for testing the plating of all parts. The standard 20 per cent sodium chloride solution is used for iron and steel parts and a 10 per cent ammonium

WHERE FINISH C



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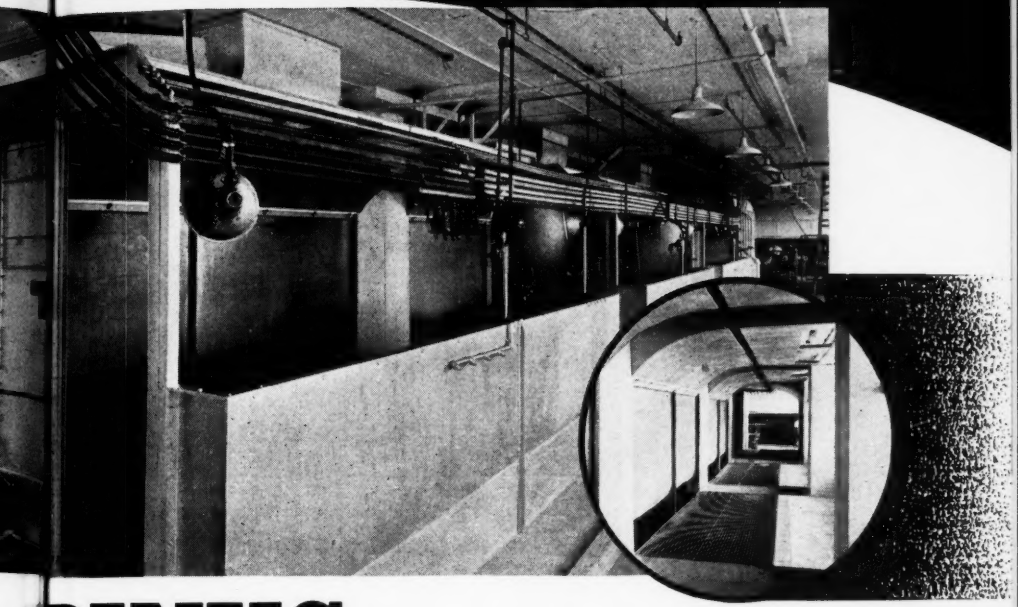

BINKS *equipment*

fans and the stacks of an ordinary spray booth are quickly washed out of the exhaust air. Fire and explosion hazards are reduced and working conditions made much more healthful.

Like most BINKS installations the one illustrated is tailor-made. It was designed for a specific job after a complete engineering survey of the work to be accomplished. This accounts for the economy and high efficiency that make BINKS equipment the favorite where finish counts. No matter how big or small your finishing problem is, BINKS engineers will gladly survey your plant and suggest the type of equipment you need for utmost economy, speed and performance

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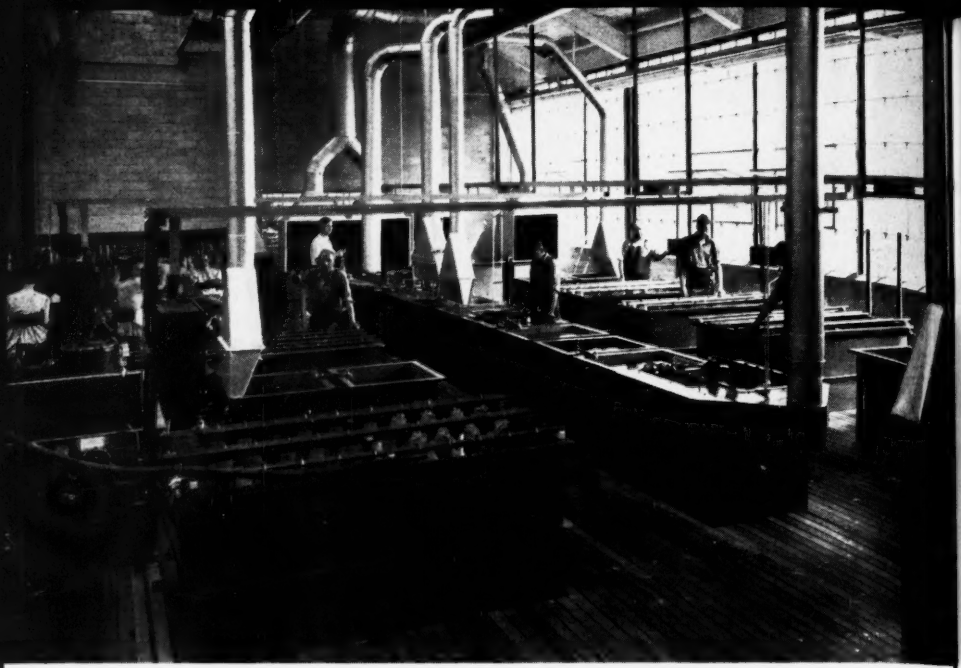

Fig. 1—A general view of the finishing department of the Spencer Lens Company.

chloride solution for brass and bronze.

The polishing department is equipped with the latest Hammond polishing lathes. Operators are frequently required to apply grain, satin, and buffed finishes to contiguous areas of a single part.

In the enameling department, De Vilbiss water curtain booths are provided for spray application and Triad W-S compound is used for conditioning the water. Enamel coats are baked in Maehler Company gas ovens, indirectly heated, and provided with Foxboro electric controls. A baking schedule of 1 hr. at 350 deg. F. is standardized for all coats. Enameled parts are tested for resistance to the solvent action of alcohol, xylol and fatty acids.

Both operating efficiency and employee safety and comfort entered into the design and materials chosen for the Spencer Lens Company plant, completed last year by The Gillmore-Carmichael - Olson Company, industrial builders of Cleveland. The Spencer plant is recognized as one of the best lighted, least obstructed and most sanitary manufacturing structures in this country.

Lightnin Mixers. The Mixing Equipment Co., Inc., 1090 Garson Ave., Rochester, N. Y., is now issuing a 16-page catalog describing and illustrating top entering mixers. Lightnin top entering mixers are mounted on gear reduction tripods or direct drive tripods. Also included in the catalog are open tanks, pipe line, horizontal tanks, and inclined nozzle mixers. Specification tables are given.

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(PF—May)

HOW DURABLE ARE HOT-DIP ZINC COATINGS?

By WALLACE G. IMHOFF

President, Wallace G. Imhoff Co., Vineland, New Jersey

THE layman, or man on the street, the man who has a garage made of galvanized sheets, the farmer whose barn is covered with galvanized sheets, engineering and maintenance departments of cities and municipalities, and a long list of others would like to know exactly how long the life of a hot-dipped zinc coating is, what are the main causes of its destruction and failure, and what knowledge of zinc coatings is necessary to intelligently purchase galvanized materials.

The satisfactory protection of iron and steel articles against corrosion is so commonplace, the use of hot-dipped zinc coatings with practically indestructible service such as on water pails and wash tubs, are so well known to everyone, that when a failure does occur, it is only natural that the layman should want to know the cause of the failure. The farmer understands planting and raising his crops; but he does not understand why his galvanized wire fence rusts so quickly, or why the galvanized sheets on his barn corrode in such a short time. This article, therefore, is written for his benefit; its primary purpose, however, is to provide the finishing department foreman or superintendent with information so that he can point out in plain, simple language to the layman, the farmer, and the man on the street, some of the main features of the life of zinc coatings.

It is well at the beginning to know that a hot-dipped galvanized article has a protective coating that affords maximum protection against corrosion. Early failure of any zinc coating therefore is distinctly not due to the type of coating, but to other causes. These causes are many, so that they will be listed below, and briefly discussed in a simple way so that the layman can appreciate, and understand them.

1. Weight of Zinc Coating

Iron and steel are protected by a zinc coating because zinc is more easily corroded by rain and atmospheric agencies; that is to say, in plain language the zinc dissolves first, and so long as there is any zinc on the base metal it will have protection. Thus, the very first consideration for a long life against corrosion attack is that the zinc coating be heavy. From the standpoint of corrosion alone, generally speaking, it can be said that the heavier the zinc is deposited as galvanized coating, the longer the life will be. So the first consideration, and the basic factor is a heavy zinc coating.

2. Purpose, or Use of Zinc Coating

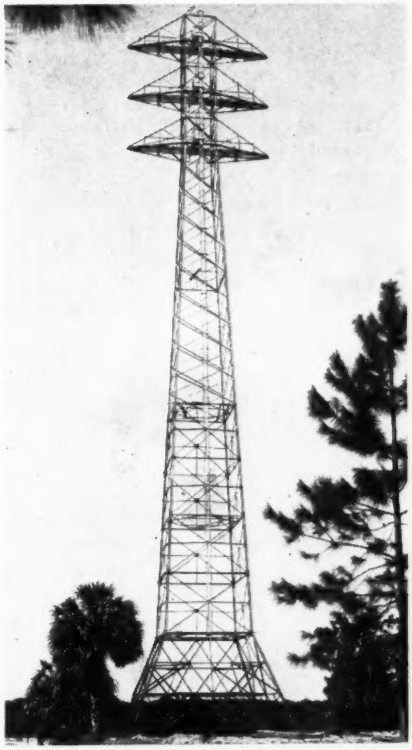
It is very plain to the average person that a hammer, a chisel, or even a penknife blade cannot be used for a screwdriver; a screwdriver has but one purpose, in other words, it is definitely made to drive screws. The same general line of reasoning applies to zinc coatings — they are of different types and kinds, and each type or kind has its own particular use, or purpose. The layman must understand this, and therefore inquire about the different kinds of zinc coatings, and by making himself familiar with the different coatings, get the right coating for the right purpose.

3. Kind of Base Metal

Attention of the layman is called to the fact that the kind of base metal upon which the zinc coating is placed, is a very important factor in the life of the zinc coating. For example, wrought iron, simply by virtue of being wrought iron, takes on a very much heavier coating of zinc than does steel under identical conditions of manufacture. It is the character of the base metal that causes this difference in weight of metal deposit under identical conditions of galvanizing. Malleable iron, cast, and gray iron also take on a different weight of zinc deposit from steel. It is important to remember that the kind of base material affects the weight of zinc deposited as galvanized coating, and attention has already been called to the fact that the weight of the zinc deposited is a prime factor in the life of the coating.

4. Purity of Materials

There is an old saying that "A chain is only as strong as its weakest link." This is also true of zinc coatings—their life is only as good as the purity of the materials used. The purity of the base metal, the purity of the zinc, and the skill, or technique of galvanizing, are all basic factors in the life of zinc coatings. When fence wire rusts quickly, it does so because the coating has not been properly applied; when galvanized sheets rust quickly on barns it is because the coating is not heavy enough. Many examples can be seen



(Photo courtesy Bessemer Galvanizing Company)

Fig. 1 — Galvanized structural steel is subjected to outside corrosive conditions while in service. The high tension tower shown here is an example of fabricated and galvanized structural steel.

everywhere showing that when the zinc coating has been applied properly, and when the coating is heavy enough for the service required of it, that protection against corrosion is not only satisfactory, but almost indefinite.

5. Corrosion Conditions

The conditions of corrosion are a very important factor in the life of zinc coating. This is due to two angles involved; namely, 1. The type of service required; and, 2. The kind of coating used. To make this point clear to the layman we might call his attention to the zinc coating on the high tension towers that he sees in the fields, and up over the mountain slopes. This is straight outside corrosion requiring protection against the ravages of the weather, so this type of coating must be heavy. On the other hand, there is the zinc coating on poultry equipment for inside service, with little corrosion attack. But another requirement is necessary; namely, that of allowing the coating to be formed and bent, and to have mechanical work done on it. Therefore, for light corrosion service, the weight of the zinc can be less, so that the forming and bending qualities can be obtained.

Attention is called also to the fact that corrosion service includes such factors as ground service, acids and alkalies, fumes, salt air near the ocean, fog and smoke of the cities, and so on. All of these are a very decisive factor in the life of a zinc coating. Perhaps the most important corrosion influence on the life of zinc coatings is what might be called "suppressed corrosion." By this is meant service under continually damp and moldy conditions, with no sunlight, or air currents. This type of service will destroy zinc coatings fastest, thus providing the shortest life.

6. Adherence to the Base Metal

Since the zinc coating is a thin outer skin shell for the base metal beneath, protection and life of the article is a function of the coating sticking tightly to the base metal. Destruction of the zinc coating may be caused by mechanical means, such as banging, striking, or knocking against something, or peeling and flaking of the coating may be caused by the wrong use of the coating. For example, in heavy ash cans wavy or corrugated ribs, or strips, are run down the sides on the outside of the cans. It was found that in some plants the crimping of these strips was too severe for the weight of the zinc coating on the strips. This caused the coating to flake off; a lighter coating, and wider crimps solved this problem.

Sometimes low adherence may be due to manufacturing causes, a very important one being corrosion during drying. The fine corrosion layer over the surface keeps the zinc from alloying with the base metal. Such an insulating layer therefore may be the cause of low adherence of the zinc coating. It is therefore important that the zinc coating adhere tightly to the base metal in order to properly protect it.

7. Service Required

It has been briefly mentioned that the life of the coating depends to a very large extent upon whether the right type and kind of a coating have been selected for the services required. Corrosion is one service, and from this main use other modifying factors of service vary the thickness and the weight of zinc used. Heavy

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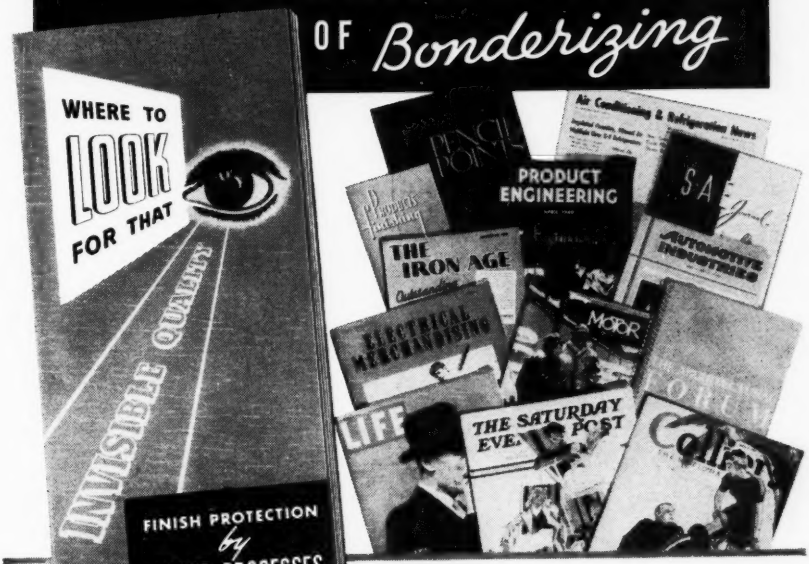

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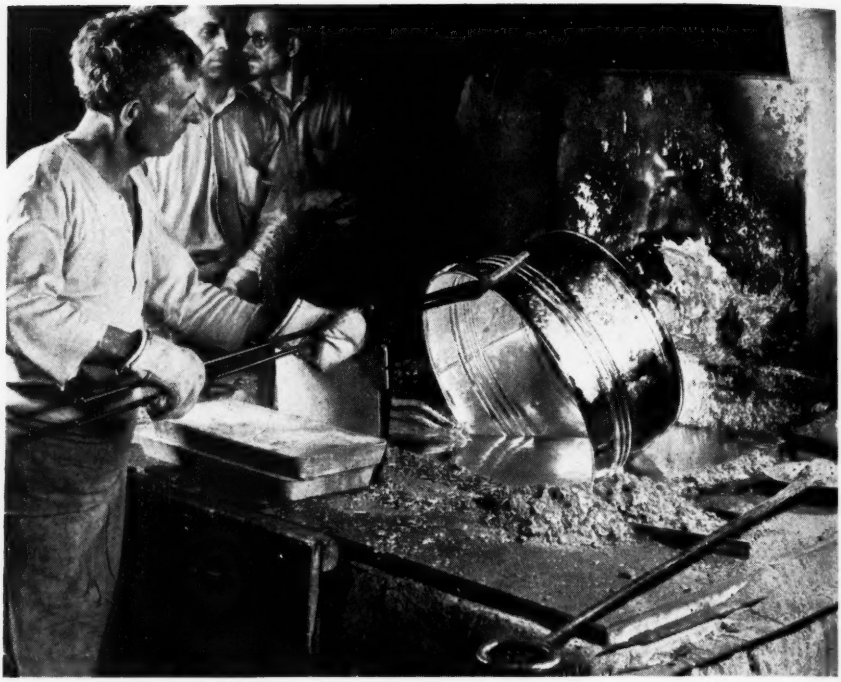

(Photo courtesy National Enameling and Stamping Company, Milwaukee, Wisconsin.)
Fig. 2—Illustration showing how a fabricated wash tub is immersed in the molten zinc.

zinc deposits are required for corrosion service alone, and for severe conditions, while lighter coatings are required where bending, crimping, weaving, and twisting, and so on are to be a part of the fabrication process. Some coatings may even be painted later, such as billboards, barn roofs, and so on. Thus, the life of the coating depends upon the right coating for the right service.

8. Time

The element of time naturally is an important factor in the life of zinc coatings. However, in the Annual Review Number of The Iron Age, January 1, 1931, page 266, there is a picture of a galvanized roof, and the title says, "After 95 Years . . . Still in Excellent Condition." It also states in the reading matter—"The roof was of 20 gauge corrugated galvanized wrought iron sheets and has never been replaced; of course, it has been repaired, but not on account of corrosion or rust but due rather to where it has been blown off. Will state that the roof has been painted on an average of every fifteen years." This roof is on the United States Mint in New Orleans, which was built in 1835. And then again in The Iron Age of November 16, 1939, page 130, we see the picture of a nail. It is stated, "When Grant was President, this nail was driven into a roof at the old Peach Bottom Quary near

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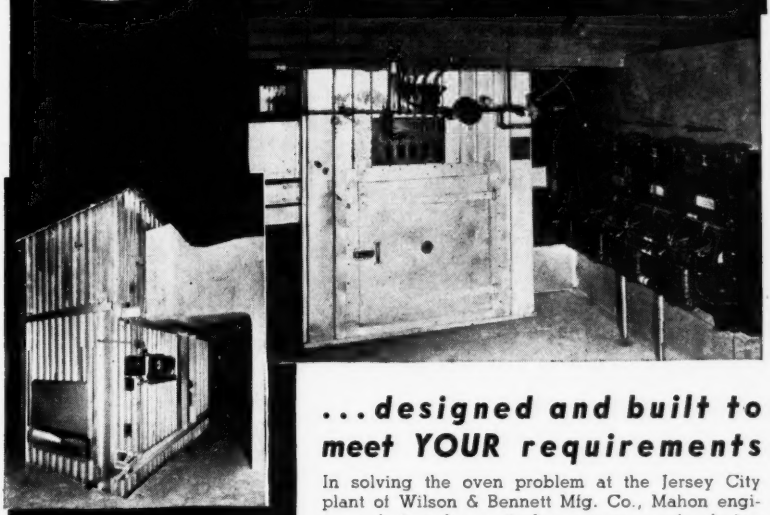

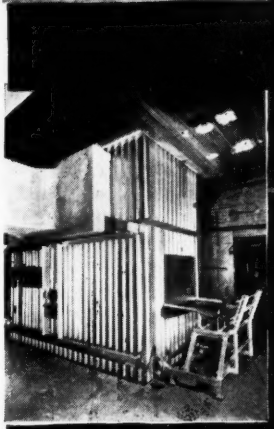

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Treichlers, Pa. Forty-seven years in this building and sixteen more in the mud beneath. This Hot-Dip Galvanized nail is one of many recently discovered which, although showing signs of wear in their zinc coatings, were entirely untouched by rust. Hot-dip galvanizing is still the greatest value in rust protection known to modern science." Speller found a well galvanized piece of roofing in Panama that had been in service for twenty-five years, and so such examples as these, and many others, clearly show that when a zinc coating is put on a good high quality base metal, with a good quality of zinc, and good workmanship, the life of the zinc coating is maximum when used for protecting iron and steel against corrosion. Time is a factor of destruction of the coating, and will work in favor of destruction in proportion to the quality of the galvanizing, the quality of the base metal, and the quality of the zinc, and the weight of the zinc making up the coating.

9. Surface Conditions

The life of a zinc coating is very materially affected by the surface conditions of the base metal. For example, the material should not be allowed to stand exposed to the weather and be coated with a heavy coat of rust before the zinc coating is put on. Steel must be fresh and in good condition for coating, just the same as a surface must be in good condition before it can be painted. It must be clean and free of oil and grease, it cannot be too smooth, porous, hard, and it must be pickled and cleaned properly, exposing the clean, pure iron to the molten zinc. Poor, low grade base metals cannot give a high quality galvanized product.

There is also a difference in the surface condition and texture of wrought iron, steel, cast irons, and so on. In wrought iron, there are large places for the molten zinc to flow into and give a heavy grip to the coating; steel is smooth, and the coating is lighter. The weight of the coating and the grip to the base metal are the important factors in the life of a zinc coating.

10. Thickness of the Zinc Coating

There is considerable difference between the ideas of weight of zinc coating, and thickness of zinc coatings. It is possible to have a heavy, light coating, and, a light heavy coating. For example, a bath very highly saturated with iron may give a thin zinc coating, but the coating will be heavy due to its iron content; and also, a zinc coating may be very thick, and due to the zinc being very pure, the coating may be light. This information can easily be proved by comparing the weights of a definite number of articles coated in a new zinc bath, and the same number and kind of articles in the same bath six months later, after the kettle has been drossed many times. Wire coattings must be very thin, and very light, to give suitable properties for the severe bending and twisting required from wire. Some coatings are very thick, such as might be found on wrought iron plates. Such coatings may be 4 ounces in weight to the square foot. On the other hand, tight coat sheets and other articles may have less than 1 ounce of zinc in weight per square foot. This does not infer that the 1-ounce coating is of inferior quality, it means that the 1-ounce coating will be used for a different purpose.

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11. Method of Manufacture

A number of articles that are galvanized are fabricated first, and galvanized afterwards. Others are made from material already galvanized. A typical example of articles that are made first, and galvanized afterwards are the ordinary water buckets. The usual, high quality galvanized water pail is first made out of black steel, then cleaned and pickled, and then zinc coated. Such a zinc coating is about .0040 inches thick, and amounts to from 2.25 to 2.50 ounces of zinc per square foot area. The other type of water pail, which of course, is cheaper, is the water pail made out of galvanized sheets. It is impossible in making this type of pail not to damage the zinc coating when crimping in the bottoms. Other examples are woven wire fence—one type being galvanized after fabricating, and the other type, less expensive, and of course, not as good, is made from wire already galvanized.

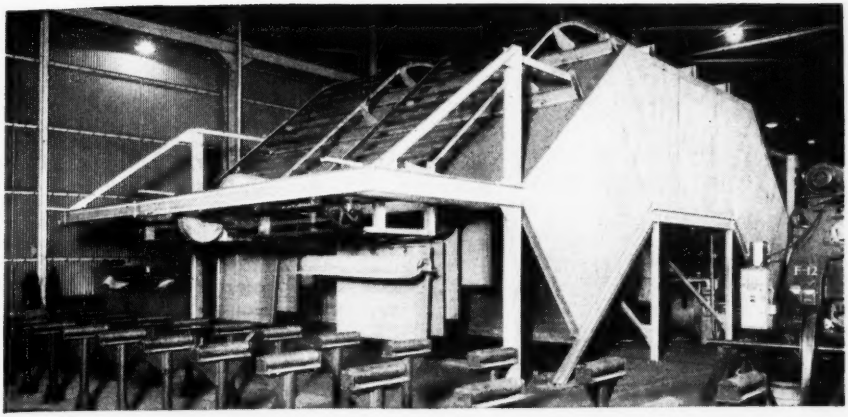
12. Ductility of the Coating

The life a zinc coating in some cases depends upon its ductility. Years ago, electrical conduit had elbows and couplings, and so on, to make turns and bends around corners. Modern electrical conduit has none of these elbows — the coating is very light and ductile, and bends are now made by the electrician who steps on the conduit and bends it to fit the curvature. This can only be done with thin, light, ductile zinc coatings, and again emphasizes the right zinc coating for the right service and place. Corrosion is not much of a factor in this case so that the weight of zinc coating can be sacrificed to obtain ductility and bending qualities of the coating. The purpose and the type of service therefore must be known before selecting a zinc coating.

Summary

When zinc coatings do not have a satisfactory life, it is not the fault of the zinc coating. That galvanizing is by far one of the cheapest and the best methods of protecting iron and steel against corrosion may be seen from still another practical example cited in "Sheet Metal Worker," February 12, 1926, page 3, under the title of "Winner of Galvanized Roof Contest." The galvanizing was done by the Wheeling Corrugating Company in Wheeling, W. Va. The roof is on the house of J. P. Holdorf, situated nine miles west of Fort Madison, Iowa. The steel is 28 gauge steel, 28 inches wide, and was laid by R. C. Beam in 1860. The base metal was charcoal iron, and the weight of the zinc coating was 4.25 ounces of zinc per square foot. "The Iron Age," Vol. 123, p. 949, April 4, 1929, describes corrugated roofing that was serviceable after seventy years in the Philippine Islands.

It would therefore seem that to obtain the most satisfactory life from a zinc coating would be for the layman to insist upon the right material for his needs. It has been clearly demonstrated from actual examples that for straight corrosion service, galvanized charcoal iron, galvanized wrought iron, and copper bearing steels are, as a base metal, superior to ordinary steels from the standpoint of corrosion. Add to this a good high quality heavy hot-dip galvanized zinc coating and the protection afforded will be maximum. Thus, customers who desire a galvanized roof of many years endurance should not only purchase galvanized wrought iron roofing, but should also insist on a heavy deposit of zinc in the coating. The price factor is an im-



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portant first factor, but based on the life and service of the roof, will be found to be cheapest in the end. The sequence of life and cost is—charcoal iron, wrought iron, copper bearing steel, straight carbon steel, increase gauge of base metal and thickness and weight of the zinc coating.

The same general line of reasoning holds good for the farmer and his wire fence. A fence that rusts quickly does not have the zinc on the wire to give it the proper protection against corrosion. That is not the fault of galvanizing, but distinctly the fault of the manufacturer of the fence who has not made a fence with a heavy enough zinc coating to give a satisfactory life. The farmer and others requiring galvanized fences must therefore insist on a fence that does have a heavy coating of zinc on it.

It has been mentioned also that articles galvanized after fabrication have better zinc coatings, and heavier zinc coatings, in comparison with cheaper articles of the same kind made from galvanized sheets, or galvanized wire. The quality of zinc coatings applied to fabricated articles is always of a higher quality than on those made from base metals already galvanized.

The purchaser should always keep in mind the service that is required of the zinc coating, and also the time element in a long time installation, or temporary service.

The purpose is another extremely important factor to consider when buying galvanizing. For example, a pan, pail, or container for seeds, grain, and so on, will be cheaper, and just as serviceable, if made of galvanized sheets, as a container that is galvanized after fabrication, and consequently higher in price because it is a better job and has more zinc in the coating. The service here permits the use of the inferior zinc coating, which is secondary to the service required. On the other hand, pails, tubs, and so on, for water should be galvanized after fabrication, giving a heavier zinc coating, and a higher quality product.

The purpose for the zinc coating was strikingly illustrated in the examples of the very light ductile coatings required for electrical conduit, and poultry equipment. Opposite this type of service is the very heavy straight corrosion service zinc coating whose only function is perfect protection of the base metal from rust. High tension towers, structural steels for electrical switching stations illustrate this type of service where no bending is done and only straight protection service is required.

It is also called to the attention of the layman that zinc is readily soluble in alkalies, and acids, and hence cannot be used where they are present. If the conditions are such that the acids or alkalies are present in very small quantities, then the life of the zinc coating may be expected to be directly proportional to the quantities of acids and alkalies present.

Another point of great importance in considering the life of zinc coatings, especially in water boilers, is to remember that rust found in the water may be formed outside the range boiler in other parts of the system. For example, pipes in heaters, bucket-a-day stoves, and other small auxiliary water heating equipment may be the actual sources of the rust formation. The rust is picked up by the water and carried into the boiler, and of course, gives the appearance that the zinc coating on the inside of the boiler has failed causing the water to be rusty.

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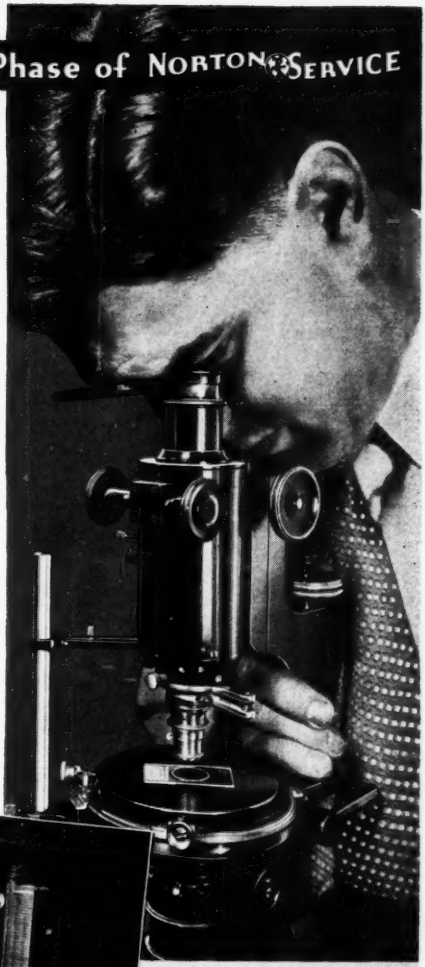

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galvanized material so that it is not stored in damp warehouses. Suppressed corrosion, with still, damp, air, and moldy moist conditions, are conditions which accelerate destruction of zinc coatings. Zinc is quickly attacked by the air and water to form basic zinc salts, and if conditions are aggravated, destruction goes on at a very rapid pace and exposes the bare steel beneath. Storage conditions should be light, clean, dry, and the galvanized articles should be piled on four-by-fours, or two-by-fours, to allow free circulation of the air in and around the piles. The piles should also be kept a short distance away from walls, and from each other. Warehouse windows with rain and dampness blowing in should not be left open; doors, large cracks in the floor, and so on should all be closed to keep out the weather. A heavy white deposit over the zinc coating indicates that storage conditions have been unfavorable somewhere.

It has been pointed out that the main factor in the life of a zinc coating is the weight of the zinc coating, and that early failure is due to the fact that not enough zinc was applied in the first place. Essentiallly, a heavy zinc coating is required for straight corrosion service, to give a long life.

"Fifty Years of Finer Plating." This is the title of a beautifully illustrated 24-page booklet describing finishes produced by Philip Sievering, Inc., which is now being issued by Philip Sievering, Inc., 195 Lafayette St., New York, N. Y. The booklet describes the services rendered by this company by providing practically all types of plating and metal finishing in commercial use today.

Philip Sievering, Inc., maintains a laboratory where finishing problems are analyzed and worked out according to customers' specifications. A copy of "Fifty Years of Finer Plating" will be sent free upon request.

Electromode Industrial Portable Electric Heaters. The Electric Air Heater Co., Division of The American Foundry Equipment Co., 555 S. Bykrit St., Mishawaka, Ind., announces the publication of a new bulletin on their Electromode Industrial Portable Electric Heater.

This bulletin is beautifully printed and shows the heater in natural color. A listing of complete specifications, dimensions, capacity ratings, and features, make this an important addition to the file of the architect, contractor, building, plant superintendent, purchasing agent, and others interested in economical portable heat.

In addition to filling a vital need among industrial plants, it is said that this heater is finding wide appeal commercially in factory offices, crane cabs, and other places of this kind where economical heat is a problem. A copy of this bulletin can be obtained by writing to this magazine or direct to the manufacturer.

Logan Aridifier. A bulletin explaining the operation of the aridifier in removing moisture, oil, and dirt from compressed air is now being issued by Logan Engineering Co., 4912 Lawrence Ave., Chicago, Ill. The bulletin is designated as No. 340 and explains in detail the operation of the aridifier in removing contamination from compressed air by centrifugal force.

Contamination is said to impinge upon the vanes of four aluminum rotors rotating in opposite directions, driven by the air without appreciable back pressure. Impinged matter is thrown outward by centrifugal force to the housing wall where it runs down and out through an outlet to a trap.

Application and installation details are given on all sizes from ⅜ in. to 10 in. and pictures of representative installations are shown. A copy of this bulletin will be sent free upon request.

Gehnrich Industrial Ovens and Dryers. A 32-page catalog, designated as No. 107, is now being issued by The Gehnrich Corporation, Skillman Ave. and 35th St., Long Island City, N. Y. Gehnrich Ovens and Dryers are designed for baking Japan, enamel, lacquer and synthetic resin finishes. Outstanding features of Gehnrich Ovens include: Insulated steel panel construction; pat-

ented dual panel and assembly; indirect internal heating; fresh air circulation and exhaust systems; horizontal heat flow air convection systems; integral convection heating systems.

Illustrations are included in this catalog showing the various applications of Gehnrich Ovens and Dryers. A copy will be sent free upon request.

Eastern Mixing Equipment. A 24-page catalog covering the Eastern line of portable mixers is now being issued by Eastern Engineering Co., 55 Fox St., New Haven, Conn. Several of the headings of the catalog are as follows: Engineering considerations in mixer selection; medium-duty industrial mixers; heavy-duty industrial mixers; side-entering and fixed vertical mixers; and laboratory stirrers. Items discussed under the first heading include power required for mixing high speed vs. low speed, single vs. dual mixers, and so on.

Information on a line of transfer pumps and precision temperature regulators is also included. Among the pumps illustrated and described is a midget laboratory unit which weighs only two pounds and, with internal capacity of 12 cc., can deliver four to five gallons a minute.

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Ferro Technical Bulletin No. 5. "Hairlining of Sheet Steel Enamels" is the subject of Technical Bulletin No. 5 which is now being issued by Ferro Enamel Corp., 4150 East 56th St., Cleveland, Ohio. The information contained in this bulletin is the result of research which was carried on by Mr. B. J. Sweo, in conjunction with the research laboratory of the Ferro Enamel Corp.

The contents of the bulletin are published under four distinct headings. These headings are as follows: Description of Test and Test Methods; Experimental Work and Observations; Discussion of Cracking of a Fired Coat; Commercial Application.

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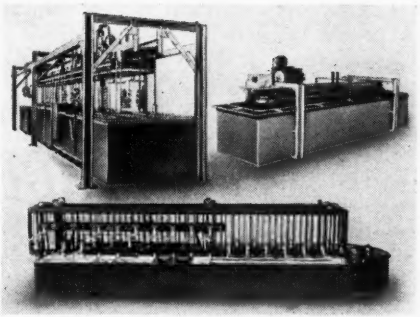

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METAL COLORING THEORY AND PRACTICE—PART 5

By Joseph B. Kushner, Ch.E.
Electroplating Consultant

BRASS, the most common alloy of copper, is somewhat more difficult to color than copper itself. Theoretically, brass is a binary alloy consisting of a solid solution of mutually soluble copper and zinc, but actually, for practical and sometimes unavoidable reasons, other metals such as lead, tin, selenium and aluminum are often present. Each of these metals may react differently with the same chemical coloring agent and tend to produce spotiness or streaking. A particularly difficult brass to color, for example, is commonly known as "free cutting brass." This form of brass contains lead as a component. The lead, which is insoluble in the matrix, exists throughout the alloy in the free state, in finely subdivided form when well mixed and acts as a sort of lubricant for the the steel tools used in machining the brass. However, what is good for the machinist is not good for the plater or colorer. The lead, especially in poorly mixed alloys, will often cause staining and spotting and streaking even after a uniform color has been produced, and as usual, the plater gets the blame.

Joseph B. Kushner

In coloring brass, even the cleaning and pretreatment must be considered if uniformity of finish is the desired factor. Thus, for example, cleaning treatment of brass in ammonia - soap solutions tends to whiten brass, that is, increase the surface concentration of zinc, because copper goes into solution in ammonia with the formation of cuproammonium complexes. A hydrochloric acid dip will tend to redden brass because some of the surface zinc is leached out by the muriatic acid, which does not dissolve the copper. Since, as was pointed out in a previous installment, chemical coloring is essentially a surface reaction, we have here two entirely different metals to contend with, even though we originally started with two pieces cut from the same stock. The surface composition is different and it is only natural to expect two metal surfaces of differing composition to react differently with the same reagent.

It is the little considerations that will often mystify the plater and cause him to resort to the aspirin tin more frequently than he should. A batch of material may be cleaned in a cycle involving a muriatic acid dip, then given a brown finish with one of the more common reagents. A few days later another batch of the same metal comes in to be colored the same way. Absent mindedly the plater indulges in a slight variation in the cleaning cycle and uses a sulphuric acid dip instead. Presto! On dipping the work in the coloring solution he doesn't seem to be able to get the exact shade he got two days before on what he could swear is exactly the same metal and with the same coloring solution. That is why very often metal coloring, even for production work, is called an art requiring long experience and personal talent of its practitioners.

It is this writer's contention that production metal coloring can be less of an art and more of a controlled chemical process. As was pointed out before, there is no reason why chemical control and standardization cannot be brought into metal coloring. It may take long years of education but it can be done. Of course, in isolated instances, art metallry calls for individual finishes that depend purely on the skill and artistry (in the correct sense) of the metal worker. But most metal work today is production work requiring absolute uniformity of finish and simplicity in treatment. It is here that metal coloring can and should be put on a more scientific basis.

Coloring Formulas

There are a number of formulas that can be used successfully for col-

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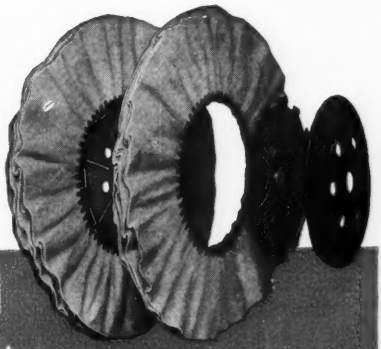

CORPORATION

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oring brass. Some of them are given here.

Golden Yellows

Copper acetate.....3½ oz.
Water .....1 gal.
Temperature.....150 deg. F.

For best results, the copper acetate should be acid free. Dip the work into solution until proper color is obtained, rinse thoroughly and dry in sawdust. Coat with a clear lacquer.

Sodium hydroxide .....2 oz.
Copper carbonate .....3 oz.
Water .....1 gal.

Use this formula at room temperature or slightly above. Follow the same procedure as with the previous formula.

Another method for "yellowing" brass is to dip it for a few minutes in a saturated solution of sodium chloride to which a little muriatic acid has been added. Here, the brass is yellowed by the leaching action of the chloride ion on the zinc.

The following formula produces golden yellow colors at room temperature and which change to browns as the temperature is increased to 150 to 160 deg. F.

Lead acetate ..... 1 oz.
Sodium hydroxide ..... 2 oz.
Potassium ferrocyanide ..½ oz.
Water ..... 1 gal.

Browns and Bronzes

There are a variety of methods for producing browns and bronzes on brass. Some depend on the production of copper sulfide, others depend upon the formation of the oxides of copper.

A rich brown shade is produced by the following:

Potassium sulfide.....2 oz.
Ammonium hydrosulfide, ½ fl. oz.
Water .....1 gal.
Temperature .....150 deg. F.

After immersing the work in this solution for a moment or two, dip it directly into a dilute solution of sulphuric acid (10 per cent) to which a little sodium nitrate has been added. This darkens the color and makes it more uniform. Rinse work well and scratch brush dry. If color is still too light or non-uniform, repeat the operation.

In the use of this particular bath and all sulfide baths in general the writer recommends that a hood be used. The moment acids come into contact with sulfides the peculiarly obnoxious odors of hydrogen sulfide (rotten egg gas) are generated. In the plating shop, acid fumes frequently occur and these tend to cause the liberation of small amounts of H_2S which may go unnoticed in the hustle and bustle of production but which are toxic nevertheless. There is no need for the plater to be subjected to the olfactory insult and toxicity of hydrogen sulfide, since it can be avoided by the use of a hood.

The well-known "English Bronze Finish" is produced by the use of the two solutions given below:

A. Liquid sulphur .....½-1 oz.
Water .....1 gal.

B. Copper sulphate .....2 oz.
Water .....1 gal.

Clean the work well, then dip it from A to B. Rinse and scratch brush dry. Repeat the dipping procedure, rinse, scratch brush wet, rinse and dry in sawdust. Coat with a clear lacquer.

A bronze having the appearance of oak wood can be obtained from the following solution:

Antimony sulfide .....2 oz.
Sodium hydroxide .....4 oz.
Ammonia.....¼ fl. oz.
Water .....1 gal.
Temperature.....160 deg. F.

The color can be darkened, if desired, by dipping the work into a weak muriatic acid solution (5 per cent) immediately after removal from the sulfide dip.

A warm brown color can be obtained with a dip of the composition given here:

Potassium sulfide .....½ oz.
Barium sulfide .....1 oz.
Ammonia .....1 fl. oz.
Water .....1 gal.
Temperature .....200 deg. F.

A rich bronze color can be obtained with the following:

A. Copper chloride ..... 4 oz.
Ferric chloride ..... 4 oz.
Water ..... 1 gal.

B. Potassium sulfide .....½ oz.
Water .....1 gal.

Dip the work into solution A, then without rinsing into B. Now rinse well and scratch brush. Repeat operation until the desired depth is obtained. Rinse, dry and lacquer.

Another brown of umber hue:

Copper chloride .....4 oz.
Tartaric acid .....2 oz.
Sodium hydroxide .....2 oz.
Water .....1 gal.

Dissolve the copper chloride and tartaric acid first, then gradually add the caustic soda. Use the solution hot.

A chocolate colored bronze is produced by the following solution:

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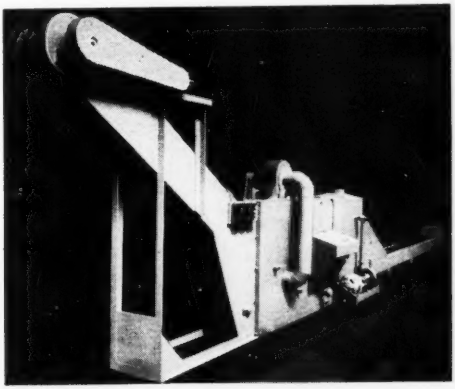

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Copper sulfate .....4 oz.
Nickel ammonium sulfate, 4 oz.
Potassium carbonate .....4 oz.
Water .....1 gal.
Temperature .....Boiling hot

Dip and scratch brush wet. Repeat until desired shade is obtained.

It is also possible to bronze brass in beautiful antique effects by hanging the work to be bronzed in a smoky flame such as is produced by burning hay or damp straw for several days, but this method is too long drawn out for production work.

Greens

All of the patinas (genuine) and most of the simulated greens are basic compound of copper. Those in which no basic compounds are formed are unstable, sensitive to light and generally unsatisfactory for use.

A light sensitive green which changes to black on exposure to light and which may be of interest to colorers looking for photographic effects is produced by the following:

Copper acetate ..... 5 oz.
Sodium sulfate .....10 oz.
Copper chloride ..... 3 oz.
Acetic acid .....1 fl. oz.

Let the solution dry on the work and repeat the process until the green is uniformly spread over the surface.

An antique green can be simulated by the following procedure: Dip work into a mixture of

Ammonium chloride .....¼ oz.
Cream of tartar..... 1 oz.
Sodium chloride ..... 2 oz.
Copper nitrate ..... 1 oz.
Water ..... 1 qt.

Dip work into this solution or brush it on and permit it to dry. Repeat as many times as is necessary.

A light yellow green can be obtained from this solution:

Ammonium chloride .....10 oz.
Copper acetate ..... 8 oz.
Water ..... 1 gal.
Temperature.....180 deg. F.

Prepare work by polishing those points that are to be highlighted and matting those points to be lowlighted. Scratch brush dry.

A blue green sometimes referred to as a hardware finish:

Sodium thiosulate .....3 oz.
Ferric nitrate .....8 oz.
Water .....1 gal.
Temperature.....180 deg. F.

This formula works particularly well on plated brass. Rinse the work well after dipping, dry in sawdust and lacquer with a green tinted lacquer.

For an antiqued green effect the following can be tried:

Arsenious oxide .....½ lb.
Basic copper acetate..... 3 lbs.
Copper carbonate ..... 1 lb.
Ammonium chloride ..... 3 lbs.
Muriatic acid ..... 1 qt.
Water ..... 1 gal.

Brush this on the work and permit it to dry. Continue until the proper color has been obtained.

Blue

Blue colors on brass are obtained by the well-known luster or color wash solutions which consist of solutions of lead acetate and sodium thiosulfate. A typical formula for a blue on brass is the following:

Sodium thiosulfate .....8 oz.
Lead acetate .....4 oz.

Water .....1 gal.
Temperature.....180 deg. F.

The color that is produced is due to the formation of lead sulfide on the work and the reaction is of sufficient interest to warrant discussion. Lead acetate reacts with the thiosulfate to form a soluble lead complex. This lead complex is reduced to lead sulphide by heat and the presence of other metals, and the sulphuric acid generated by the process is converted to sulphur and sulfur dioxide by the excess thiosulfate necessarily present. The reactions can be represented as follows:

1. $PbS_2O_3 + H_2O = PbS + H_2SO_4$
2. $H_2SO_4 + Na_2S_2O_3 = Na_2SO_4 + H_2O + SO_2 + S$

The film of lead sulfide produced on the work is quite thin and in the case of copper gives rise to a number of interference colors ranging from yellow almost to black. With copper, the reaction is slower and easier to control so that many colors are easily obtainable. With brass, the reaction proceeds much more quickly, the zinc in the brass forms a couple with the copper, thus giving rise to a tendency towards a rapid precipitation of the sulphide on the metal surface. Lead sulfide in mass is black and an appreciable thickness of it is produced on the brass, yet the thickness is not sufficient for opacity and as a result the yellow of the brass comes through and the overall effect is a bluish color.

Blacks

Blacks on brass are produced generally by the formation of copper oxide. A typical black chemical dip is the one given here:

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Copper sulfate .....3½ oz.
Water .....1 gal.

Add sufficient ammonia to almost completely redissolve the precipitate which first forms. It is important that no free ammonia be present as copper oxide dissolves in it and a poor black will be produced. The presence of undissolved precipitate indicates that no free ammonia is present. The temperature of the solution should be maintained at approximately 200 deg. F. After dipping in the solution above, rinse well and follow with a dip in a caustic soda solution consisting of 8 ounces of caustic per gallon. This dip has the effect of fixing the color. Rinse well, dry in sawdust, and then lacquer.

Another method for producing a black which is not as satisfactory as the first can be obtained by dipping the work in a solution of copper nitrate in water (about 50 parts nitrate to 100 water) and shaking off the excess liquid. The work should then be dried.

A formula for producing a black on brass somewhat similar to the first is this one:

Copper carbonate ...	8 oz.
Ammonia (26 per cent)	1 pt.
Sodium carbonate ...	4 oz.
Water	1 gal.
Temperature .....130 deg. F.	

Grey

Colors sometimes called antique brass which are nothing more than greyish deposits of arsenic are obtained from the following two baths, with or without current:

Arsenious acid	8 oz.
Sodium hydroxide .....10 oz.	
Sodium sulphate	5 oz.
Water	1 gal.
Temperature .....100-140 deg. F.	

Arsenious acid .....10 oz.	
Ferrous sulphate	8 oz.
Hydrochloric acid	1 pt.
Water	1 gal.
Temperature .....Room	
Voltage	6 volts

The deposits can be relieved with pumice on a wet scratch brush. The work must be lacquered.

For the production of particularly artistic effects, brass can be copper plated on certain parts by the use of stop-off lacquers after which the lacquer can be removed and the work subjected to the coloring process. This gives rise to a number of two-tone effects which can greatly enhance the beauty of the finished piece. There are also methods for grinding in pigments such as sienna and burnt umber and combining them with chemicals and lacquers to produce odd effects but these are not

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true chemical coloring methods and will not be discussed here.

In the following installment on the subject "Metal Coloring Theory and Practice," we shall discuss the coloring of iron and steel.

Westinghouse Catalog 28-000. New and improved electric heating units and controls, designed to meet specific industrial applications for heating liquids, solids, and air, are announced in a new 38-page illustrated catalog issued by Westinghouse Electric & Manufacturing Co., Heating Division, Mansfield, Ohio.

Strip heaters for use in ovens, crane cabs, valve houses, pipe lines, process machinery and hot tables; cartridge heaters for embossing machines; corox immersion heaters for oil tempering baths, sterilizers and humidifiers; and air heaters for crane cabs, truck houses, valve houses, locomotive cabs, scale rooms and garages, are featured in successive sections of the catalog, pages 4 to 17.

Pages 18 to 29 give details and illustrations of automatic electric glue pots; electric melting pots; single and three heat snap switches; thermostats for temperature control of metals, fluids, and air; switches and contactors with recommended wiring diagrams; and special heating elements for ironing machines, radiant type ink dryers, hat blocking machines, and vulcanizing units. The last nine pages cover general application data and photographs of actual installations.

Each section contains information on the application of the units to particular industrial heating problems, and tables are listed throughout the catalog to assist in the proper selection on units to meet individual requirements.

Free copies of Catalog 28-000 may be secured by writing to Westinghouse Electric & Manufacturing Company, Heating Division, Mansfield, Ohio.

Simple Methods of Analyzing Plating Solutions. Fifth Edition, 1940. This booklet was originally published in 1930 and has since that time achieved a circulation of over 10,000 copies. The present edition has been revised and brought up to date by a number of changes in details and by the inclusion of methods of analysis of the H-VW-M semi-bright nickel (9-H) solution. Obtainable on request from Hanson-Van Winkle-Munning Co., Matawan, New Jersey.

Rome Polishing and Buffing Lathes. An illustrated eight-page catalog describing Rome Polishing and Buffing Lathes is now being issued by Rome Machinery Sales and Engineering Co., 627 Webster St., Rome, N. Y. Included in the catalog are the Rome Models "MOS" and "MIS" Single Spindle Multi-V Belt Drive Polishing and Buffing Lathes and also the Models "2MOS" and "2MIS" Double Spindle, Individually Driven Multi-V Belt Drive Lathes.

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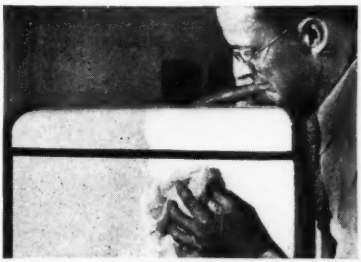

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BARREL FINISHING OF METAL PRODUCTS

Additional Factors in the Barrel Finishing of Plastics

By H. LEROY BEAVER

THE Plastics Industry, if considered in the light of the multiplicity of uses to which plastics materials may be applied, even when based on requests for information with respect to barrel finishing operations that have come to us, would oblige us to be in complete accord with the general thought that this industry now easily rates as the fastest growing in the world.

That plastics in various types and forms have already replaced metals in a wide variety of applications, there can be no question. When we sought a reason for this among manufacturers who have adopted plastics, some of the reasons for their decisions were that plastics have great eye appeal in their multiplicity of colors and color combinations. Other reasons were as follows: the elimination of machining operations requiring many types of both light and heavy machine equipment; freedom from rust and corrosion as well as tarnish which in itself provides for greater ease in maintenance; the absence of the necessity for plating a base metal such as steel with nickel, copper, chromium, silver, gold, and so on (however, some plastics are now being plated); the ease in maintaining close tolerances in production of parts; greater cleanliness in and around production plants; and when susceptible to finishing in volume lots by the barrel method, the elimination of hand labor, with a consequent speeding up of production and lowering of production costs.

One very pertinent reason given to us by a manufacturer who had adopted plastics in replacement of metal parts was that aside from most of the foregoing factors he had adopted a thermoplastic material because all rejected parts and scrap could be reground and the material remolded. This enabled him to utilize his raw material to almost 100 per cent, which is rarely possible when working in metals.

We have previously used the term "plasticity" in commenting on the cold working effect on metals as obtained by an appropriate barrel finishing operation, but this term can be applied also, but in a somewhat different sense, in a discussion of

plastics. For the most part, the plastics in most popular applications are considerably stronger when in a state of average normal room temperature than most people would suppose. For example, a rod ⅜ in. diameter and 8 in. long will require the strength of an average man to bend it to the point of fracture, but in fabricating such a rod, no heavy machinery is required to bend a plastic rod of this size into a circle, as would be the case with metal. If the plastic rod is heated to a proper working temperature in a thermostatically controlled water bath, the warmed plastic rod may readily be formed into a circle and when cooled to normal temperature will retain its circular shape. Flat forms or discs sliced or sawed from rods when heated in water may be die stamped with a wide variety of plain or intricate designs. The parts may then be finished by mass production methods in barrels following somewhat the same operating technique as in the finishing of metal products.

While plastics have been in the process of development for many years, it has only been within the past ten years or so that they have come into such wide public notice. Cellulose Nitrate and Cellulose Acetate are two of the most popular which have been developed from cotton as a base material, and were among the first to meet with wide favor. Following these are the phenolic resins from which a wide range of parts are cast in individual molds. Following these we have the popular forms of casein, urea resin and a long line of other plastics far too great to enumerate. In addition there are the plastics which have been developed for particular and special applications. Finally, we have the gorgeously beautiful methyl methacrylite as represented by Lucite, Crystalite, Acryloid and Plexiglas. In its various delicate colors crystal clearness and susceptibility to handling with unusual lighting effects will very possibly and within a short time outdistance all of its fellows in popularity.

In the plastics field, we have a very rapidly growing new industry quite aside from that of the manufacture of the plastic material itself. It is an industry that bears the same relation to the plastic field as the industry of metal stamping and forming, the manufacture of screw machine products, plating and polishing bears to the metal finishing field. Scattered all across the field of industry we have readily available many concerns whose business is the molding of plastic materials in desired forms, while others are rated as plastics fabricators who take the rough mold-

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ed or screw machine parts and give them their final operation, completing them either for "over the counter" sale as a plastic article or for assembly as a unit of a commercial product.

According to current methods of barrel finishing, the procedure is largely predicated on the condition of the blanks or forms when ready for barrel procedure. If the parts are rough of surface such as having rough tool marks, or on parts that may have been blanked from sheet material and having rough edges, a wet grinding operation is sometimes used in which case the parts are placed in a water tight, maple or sappy yellow pine barrel having a capacity of 10 to 30 gallons. In this operation, the barrel is loaded to a line at the center of the axis of the barrel, much the same as metal parts are loaded for a similar operation.

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Water is added to come just to, or a little below the surface of the load of parts. The abrasive or grinding material which may be FFF pumice or diatomaceous earth of equivalent mesh size is added in the proportion of from four to six ounces of the abrasive material to each twelve quarts of water. The speed of the barrel must, of course, be proportioned to its diameter. The desired speed should be such that the parts will rise to about ¾ the distance up the periphery of the barrel and then maintain a rather sharp angle of overflow of the entire mass in the direction of the motion of the barrel. In no case should a barrel be operated at such a speed that parts are carried to the top of the barrel where they are thrown out of the mass, for this would constitute finishing by the action of impingement, and many plastic parts and especially those having pronounced angles will become nicked or otherwise damaged. No time cycle of operation is suggested because this will depend solely on the character and depth of the tool marks or rough edges required to be removed, or rounded off.

As a general rule, there is little need at present for the preceding wet barrel operation because plastic fabricators have perfected their processing methods and tools so that tool marks and other characteristic production marks are reduced to a minimum. As a result, a dry barrel operation will generally suffice. The operation of parts by the so-called dry method is generally carried out in a six or eight sided barrel which is 24 to 30 inches in diameter and with single, double, or triple pockets averaging 24 inches in width, or barrels such as would be indicated by such barrel suppliers as Rudolph R. Seibert or The Lupomatic Machine Company.

In a dry barrel operation, wood pegs of an appropriate size or mixture of sizes are used in the general proportion of three parts of pegs to one part of the plastic parts to be cut down. Prior to placing the parts in the barrel it is customary to add about one quart of light paraffine oil, and when the surface of the pegs is all covered by a film of oil, dust in from one to two quarts of FFF pumice or diatomaceous earth of similar mesh size. As in the previous method, no operating time cycle is suggested for this is always dependent on the character of the finish desired, but in this operation, cycles of from five to ten hours are not unusual.

When the desired surface condition is obtained, and this should be a soft matte semi polish, the abrasive material is cleaned from the surface with an oil impregnated sawdust using about one quart of oil to each six quarts of fairly coarse sawdust. While kerosene oil is widely used in this operation, we do not subscribe to its use because the parts should be washed in a very mild alkaline solution, and kerosene is not readily saponifiable and far more difficult to remove than would be a very light vegetable oil, and absolute cleanliness is important to parts coming up for the final polishing operation.

As an alternative to the operation immediately above described, an operation quite widely applied to metal parts is also used wherein sawdust is utilized as the medium for carrying a greasy binding material to hold the abrasive. As in the preceding operation, three parts of wood pegs to one part of plastic parts is the customary proportion. To each three parts of pegs, one quart of grease impregnated sawdust should be used to which is added about one pound of precipitated chalk (whiting) or a material known as Celite, a form of diatomaceous earth of 325 mesh size. If this is exhausted before the desired surface finish is obtained, it would be advisable to add an additional charge of the chalk or celite. Operating time may vary from two to twelve hours, but must be continued until a finish is obtained that will be satisfactory for receiving the final or wax polishing operation.

One prominent plastics manufacturer recommends the following formula for preparing grease impregnated sawdust:

Coarse Hardwood Sawdust	100 lbs.
Precipitated Chalk (325)	25 lbs.
Twice Ground Tripoli	5 lbs.
Rendered Beef Tallow	20 lbs.
Flushing Oil	2 qts.

This composition may be prepared by placing the sawdust in the barrel in which the operation is to be per-

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formed and melting the tallow and adding the flushing oil. This solution should than be poured over the sawdust and operated in the barrel until the sawdust is fully covered. The tripoli and chalk may then be dusted in and the barrel again operated until a thorough mixture is obtained, after which the treated sawdust may be added for the cutting down or smoothing operation as above described. This material should be kept stored in covered metal containers.

For the final waxing or polishing operations there are many formulas of wax compositions, but in the main, commercial bees wax and Carnauba wax are widely used. Some typical formulas are as follows:

Bees Wax	½ pound
Carnauba Wax	1½ pound
Pure Gum Spts.	
Turpentine	1 gallon

Shave the wax into chips, place in a suitable container and add the Turpentine and dissolve, or

Stearic Acid	4 ounces
Carnauba Wax	8 ounces
Turpentine	1 gallon
Dissolve same as above, or	
Stearic Acid	4 ounces
Spermacetti	4 ounces
Paraffine Wax	4 ounces
Carnauba Wax	4 ounces
Flushing Oil	4 ounces
Beeswax	2 ounces
Turpentine	1 gallon

In using any wax preparation, new pegs should be used. For one bushel of average pegs (approximately 24 pounds in weight) melt four to six ounces of wax solution over a water bath until it is thin enough to pour. The pegs should be placed in the barrel after which the melted wax can be poured over the surface and the barrel operated until the pegs are thoroughly covered. The pegs, when properly coated, will have a "tacky" feel and the plastic parts are then added to the mass and operated until the final polish is obtained. When the wax coating is exhausted either by being absorbed by the wood pegs or by a deposit on the surface of the plastic parts, the pegs will have a glossy appearance and a smooth feel to the touch. When in this state the pegs are no longer effective. When the pegs reach this condition, the plastic parts should be removed from the mass. Two to four ounces of additional melted wax should then be poured on the pegs for renewal of their wax surface after which the parts may again be placed in the barrel and operated as before.

As a rule, barrels for plastics polishing are made eight sided, with four panels that may be removed and replaced with screen panels. In

this operation, the frictional heat developed does not permit the wax coating to become completely hardened. For this reason, after an appropriate operating cycle in the completely closed barrel, the screen panels are substituted to provide for cooling of the waxed surface and bringing it to a high lustre.

Some operators prefer to have their wax solutions reduced to liquid form so that they may be used directly from the can without heating. Others maintain that the more solid wax solutions that require melting will function more satisfactorily. In our own research, we find little difference in the final result whether the wax requires thinning or is used in its thinned state.

While the above covers in a somewhat condensed form the principal factors and formulas and the method for their use, new research is being continuously carried on toward a simplification of finishing processes for plastics. As an illustration of this we might mention that we now have several commercially applicable plastics that require only one barreling operation. The first or ashing process is followed by immersion in a solvent solution for the particular plastic. The attack of the solvent on the surface removes the remainder of tool marks and rough areas and leaves the parts with a high surface luster which is a part of the plastic itself rather than a thin coating of polished wax.

As an illustration of dip polishing, we might note casein plastic which is soluble in a sodium hypochlorite solution which is generally used at a temperature of 150 deg. F., but which may also be effectively operated at room temperatures. The parts are left in the solution for 2 to 5 minutes after which they are removed, washed, and dried. The surface is somewhat softened when first removed from the solution, but dries to a hard, glazed surface.

Dip polishes are far less expensive and more rapid than any barrel finishing operation for final luster, and certainly more permanent than wax coatings. All indications point to a greatly accelerated research activity in the development of plastic solvents for use in such final dip polishing operations Not only are dip polishes being developed, but our own research in the use of more adequate mediums than the light specific gravity wood pegs and sawdust currently operated with abrasives for preliminary smoothing operations by the barreling process is progressing at an entirely satisfactory rate. Thus, the present research is working toward a very material reduction in operating time cycles for the operation preliminary to final polish.

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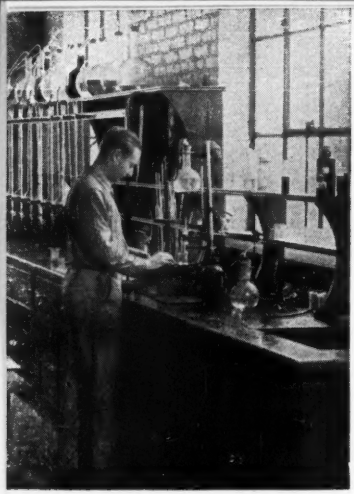
The Varnish Products Co.
5208 Harvard Ave. Cleveland, Ohio



Practical Applications of MODERN Equipment

How We Cut Cleaning Costs and Obtained a Better Finish

By L. L. MANLEY
Superintendent, New England Screw Company

TWO cleaning systems were in use in our factory when we undertook the task to reduce cleaning costs, one to take care of work coming from slotting machines and the other to handle work from threading machines. The slotted work was first hand-riddled and then washed in kerosene. The threaded work was hand-washed in a tank and dried in a gas fired rotary drier. These operations required four men to handle the work.

Under our new system, the cleaning of a great variety of standard and special screws, such as rivets, bolts and nuts in steel, steel alloys, brass, bronze, Everdur, aluminum, silver and nickel silver is done in one machine and the work is handled by two men. The cleaning is done in batches of 35 to 75 pounds, and the machine is so designed that it will clean both large and small work with almost equal speed and without mixing.

The slotted work is fed into an Ideal chip separator where all of the large chips and most of the small one are removed, and which discharges the work to the loading skip of the wash, rinse and dry machine. Threaded work is dumped directly into the loading skip of the machine, from tote boxes.

The cleaning machine, designed and manufactured by N. Ransohoff, Inc., Cincinnati, Ohio, is a double deck arrangement to conserve floor space. In the upper deck, the work is given a soaking wash, a spray wash, a drain, a rinse and a drain and the work is then discharged into the drying drum on the lower deck where it is thoroughly dried and returned to the operator. The drying drum is equipped with a hopper for receiving plated work which is not passed through the washing and drying operations.

The washing and rinsing tanks each have a capacity of 500 gallons of water. Three pounds of cleaning

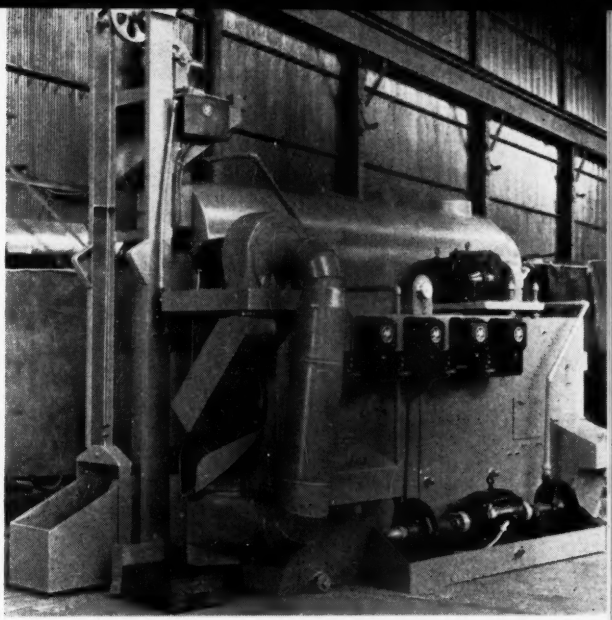


Illustration showing installation of a Ransohoff cleaning unit.

compound are mixed with the wash water and one pound of alkali to the rinse water. An additional amount is added to each tank each day to maintain the proper solution strength.

The heat for the entire setup is furnished by a 1⅛ gallon per hour oil burner in the drier, at the extremely low fuel cost of eight cents per hour.

From the oil combustion chamber the heated gasses are conducted into stainless steel tubes which heat the drying air to 400 degs. F. by indirect heat. The gasses pass on to the flues submerged in the washing and rinsing solutions which are heated to 140 degs. F.

The oil supply tank is in the basement and the fuel is pumped eight floors to an auxiliary tank mounted above the machine. The level in this tank is maintained by a float and mercury switch control.

The oil burner exhaust passes through a small lead-coated copper pipe inside a galvanized pipe. The two floor rise of this pipe to the roof produces enough natural draft to handle the exhaust.

The machine stands on a wood floor and sprinkler heads above it are set at 250 degs. F. However, the hottest place under the combustion chamber is only 180 degs. F.

An unlooked for but welcome advantage of this new system is that the finish on our product is improved in quality and is uniform. Ferrous and non-ferrous screw machine products come from the machine without a trace of discoloration and the alkali-deposit is sufficient to keep the ferrous parts from rusting over a period of from three to five months.

Efficient Filtration

By Robert J. Green
Filtration Division, Alsop Engineering Corporation

A RECENT development in portable filters is of unique design and provides a high speed machine that can be used with safety to filter practically any type of plating bath. A view of the unit—known as Hy-Speed filter—in operation in a plating department is shown in the accompanying illustration. This filter unit is designed with laminated sheets molded in disc form which provide the filtering medium.

The filtering discs are perforated with holes of various sizes to provide

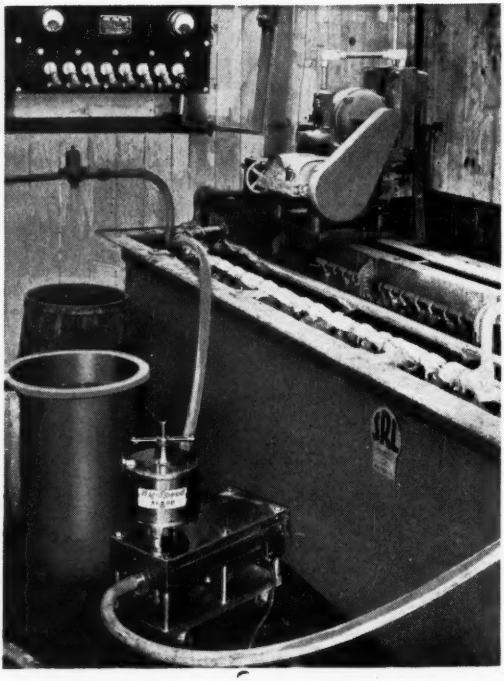


Illustration showing an installation of an Alsop plating solution filtering unit.

a number of grades of porosity. In this manner, any degree of filtration can be obtained by simply changing discs. The entire filter assembly, including the chamber and plates, can be taken apart, thoroughly cleaned, new discs installed and all component parts reassembled in five minutes' time.

By means of the Hy-Speed filter, many solutions that have in the past been neglected, such as all cyanide baths, acid copper, electro cleaners, and dilute acid dips can now be filtered. The discs of the unit are composed of a fibrous material which will withstand corrosive liquids. Since the discs are economically constructed, they can be thrown away after each separate bath is filtered.

The Hy-Speed filter is light in weight, thus making it easily portable and instantly available for any filtering job in any part of the plant. The machines are composed of various metals and alloys such as stainless steel, bronze, nickel, and Monel metal. The capacity of the portable unit ranges from 5 to 30 gallons per minute. Stainless steel units have been recommended for use in filtering solutions such as bright nickel, cadmium, and various cleaners where the solutions are filtered by means of the same unit.

This illustration shows a high-speed filter unit in operation on a bright nickel tank.

Hilo Sheet Metal Coatings. Finishing materials for coating sheet metal products are described in bulletins which have been designated as No. 20-1 to 20-10 and are now being issued by Hilo Varnish Corp., 42-60 Stewart Ave., Brooklyn, New York.

These sheet metal coatings are as follows: Finishing Coating Varnish; Finishing Varnish for Imprinting; Heavy Finishing Coating Varnish; Press Varnish; Sizing Varnish; Backing Coating Mixing; Coating Mixing Varnish "A"; Coating Mixing Varnish "B"; White Coating "A"; White Coating "B." Copy free upon request.

Mention PRODUCTS FINISHING when writing to advertisers. Your cooperation will be appreciated both by the advertiser and this magazine.

No. 13 Oil Test

Determination of the resistance of an organic finish to oil.

APPARATUS: Lubricating oil, container, thermometer.

PROCEDURE: Completely finish the panel so that no bare metal is exposed. After aging twenty-four hours, immerse the panel in the oil to a depth of two inches. Maintain the oil at seventy degrees Fahrenheit. Allow the panel to remain immersed until breakdown occurs, making daily inspections by withdrawing the panel and wiping the finish with a clean cloth. The type of oil, aging period and temperature may be varied to suit particular requirements

CONCLUSIONS: The time for the softening of the film, bubbling and change in color and gloss is indicative of the resistance of the finish to oil.

No. 14 Grease Test

Determination of the resistance of an organic finish to household greases and lubricating grease.

APPARATUS: Lard, unsalted butter, lubricating grease, thermometer.

PROCEDURE: Completely finish three panels so that no bare metal is exposed. After aging the panels twenty-four hours, coat them each with one of the greases to an eighth of an inch. Place the panels in a horizontal position and maintain the temperature at one hundred degrees Fahrenheit. Allow the panels to remain coated until breakdown occurs, making daily inspections by wiping off the greases with a clean cloth. The aging period and temperature may be varied to suit particular requirements.

CONCLUSIONS: The time for the softening of the film, bubbling and change in color and gloss is indicative of the resistance of the finish to household and lubricating greases.

No. 15 Humidity Test

Determination of the resistance of an organic finish to humidity.

APPARATUS: Humidity cabinet with vertical panel rack, live steam jet and wet and dry bulb thermometers.

PROCEDURE: Completely finish the panel so that no bare metal is exposed. After aging twenty-four hours, place the panel in the cabinet and maintain the temperature at one hundred degrees Fahrenhei and the relative humidity at one hundred per cent. Allow the panel to remain in the cabinet for sixteen hours. Remove to room temperature and relative humidity for eight hours. Repeat this cycle until breakdown occurs. The cycle, temperature, relative humidity and aging period may be varied to suit particular requirements.

CONCLUSIONS: The time for film breakdown, blistering, etc., is indicative of the resistance of the finish to humidity.

No. 16 Salt Spray Test

Determination of the resistance of an organic finish to salt spray.

APPARATUS: Ten per cent salt solution, salt solution reservoir, salt spray box inclined to twenty degrees with the horizontal and fitted with removable top, vertical panel rack and atomizer.

PROCEDURE: Completely finish the panel so that no bare metal is exposed. After aging twenty-four hours, place the panel in the box and allow to remain in the salt atmosphere until breakdown occurs. Make daily inspections, washing off the encrusted salt in fresh water. The concentration of the salt solution and the aging period may be varied to suit particular requirements.

CONCLUSIONS: The time for film breakdown, blistering, etc., is indicative of the resistance of the finish to salt spray.

A B C of Spray Painting Equipment. A handbook designated as "A B C of Spray Painting Equipment" is now being issued by The DeVilbiss Co., Toledo, Ohio.

Just about every conceivable item of spray painting equipment is described and their functions explained, in the five parts of the book. The subjects treated are, the Paint Spray Gun, its troubles, remedies, and accessories; Material Containers; Hose and Hose Connections; Air Transformers and Condensers, and Air Compressing Outfits.

The material in the book is presented in question and answer form. The questions are those most often asked at The DeVilbiss Training Schools and at the numerous clinics which The DeVilbiss Co. has conducted. The answers are comprehensive and readily understood. A most studied effort was made in preparing the book to refrain from highly technical or involved terms.

Added clarity is lent the text of the book by the frequent illustrations and diagrams found in it.

Single copies may be obtained free or arrangements made for procuring copies in bulk, by writing to The DeVilbiss Co., Toledo, Ohio.

Westinghouse RLM Fluorescent Lamp Luminaires. Leaflet 61-152 in which Westinghouse RLM Fluorescent Lamp Luminaires with porcelain enameled reflectors are described has been published by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. The luminaires are designed for general or supplementary lighting in low bay industrial areas and are available only in two-lamp, 40-watt, 48-in. sizes for spread distribution.

The leaflet gives full details regarding the construction and mounting of the RLM luminaires and, in addition, contains a chart on voltage data. Also included is a graph showing the typical spread distribution curves of the luminaire as well as information regarding the installation of this unit.

Copy of leaflet 61-152 can be obtained by writing to the Westinghouse Lighting Division of the Westinghouse Electric & Mfg. Co., Cleveland, Ohio.

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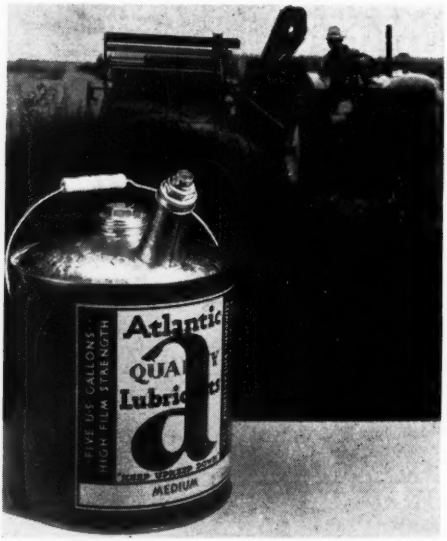
Finishes THAT AID IN APPEARANCE AND UTILITY

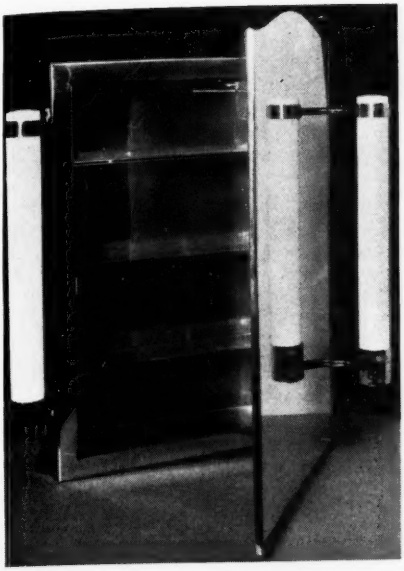
(Right) — The spatter finishes on radios of the type shown herewith are available in a variety of colors to harmonize with the interior finishes of the modern automobile.

(Photo Courtesy The Crosley Corporation)

(Photo Courtesy Modern Packaging Magazine)



(Left) — The five-gallon oil can shown here is suitable for re-use with oil, kerosene, or water and is designed for convenience and attractive appearance. The top head of the can is galvanized iron and the side is enameled in striking colors.



(Photo Courtesy American Rolling Mill Co.)

(Left)—This Mastercraft bathroom cabinet is the latest addition to the line of baked enamel cabinets manufactured by the National Metal Products Co. The brilliant stainless steel body of the frame makes it a most attractive product.

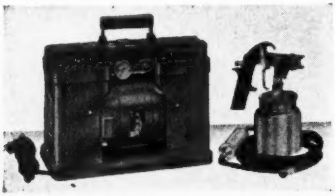
(Photo Courtesy Ault & Wiborg Corp.)

(Right) — This counter display was designed by George Welp and W. H. Ruxton for use in displaying artists' oil colors. The unit is finished with white Polymerin, Ault & Wiborg's speed-bake metal finish.

New PLANT EQUIPMENT AND Materials

Crown "Airflo" Portable Painting Unit

The Crown Spray Gun Mfg. Co., 1218 Venice Blvd., Los Angeles, Cal., is announcing a complete line of ten "Airflo" portable painting outfits driven by ¼, ⅓, and ½-h.p. General Electric motors. A new high in efficiency is said to be obtained through the use of an improved ventilation system. The diaphragm-type compressors feature welded steel frames of light weight but rugged construction. All working parts are fully encased, and the air gages, adjustable pressure pop valves, manual unloaders, and air outlets are well protected by the extended lines of design.



Crown "Airflo" Portable Painting Unit

The Type PC spray gun has the exclusive feature of an adjustable interior atomization spray head which is said to enable satisfactory results to be obtained with all types of materials. The Type SC suction type gun has full spray width control and is equipped with a container cover assembly and quart aluminum container. This gun is convertible for use with standard pint paint cans. Both the Type PC and Type SC guns are furnished with air valve assemblies which can be converted from non-bleeding to bleeder types by simple adjustment with a screwdriver, and are finished in Moly-Black.

Hilo Aluminum Paint

A quick-drying ready mixed aluminum paint is now being marketed by Hilo Varnish Corp., 42-60 Stewart Ave., Brooklyn, N. Y. This finishing material is said to be especially suitable for dipping parts such as bed springs and similar long work.

Hilo Aluminum Paint is said to have particularly good leafing. The coating dries in one-half hour to handle and overnight to ship. The finish will bake at 200 deg. F. in 15 minutes.

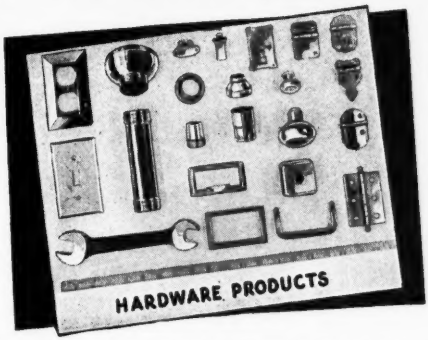
Hilo Aluminum Paint may also be applied by spraying. The finish can be reduced two parts paint to one part of aluminum paint reducer for dipping, or one part of paint to one part of reducer for spraying.

Binks No. 240 Spray Line Marker

The Binks Manufacturing Co., 3114-40 Carroll Ave., Chicago, Ill., has placed on the market a spray line marker to be known as the No. 240. This unit is

Volume Finishing at a Saving

Packer-Matic Automatic POLISHING & BUFFING MACHINES



* Finishing Room costs are vital factors in Production. They must keep step with competition and still show a Profit. Packer-Matic is the answer.

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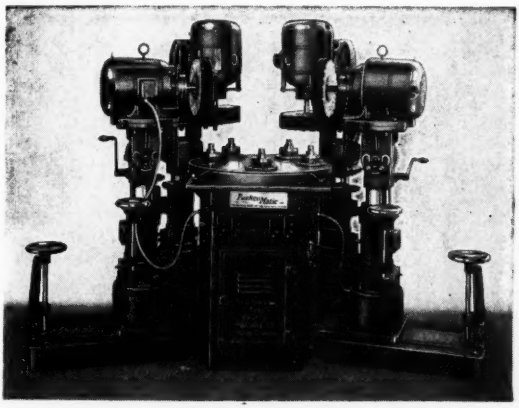

* Varied shapes and sizes of Parts both large and small are efficiently Polished and Buffed on Packer-Matic — Automatically — the modern way. Three types of Packer - Matic, Rotary (shown), Straight Line Conveyor and Roll, are proving their value, daily, in factories where volume Finishing is imperative.

Send your Part and get a "Time Study," gratis — you'll find it worthwhile. WRITE "Time Study" Dept.

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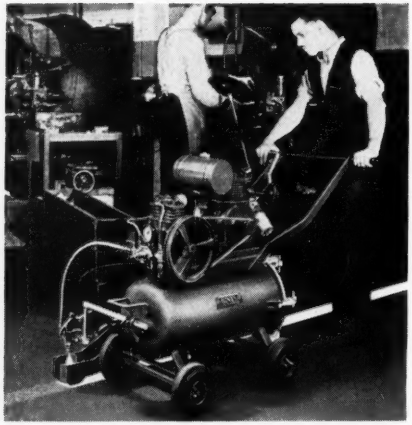

Binks No. 240 Spray Line Marker

said to be a self-contained portable spray unit for the marking of traffic lines for factories, warehouses, and so on.

The No. 240 spray line marker is designed for one-man operation and is said to be capable of laying down a stripe from two inches to six inches in width at the rate of four miles per hour, depending on the condition of the pavement or floor. The unit is equipped with a ¾ h.p. gasoline engine and pneumatic tires. A twelve gallon material pressure container provides the spray gun with material.

No. 1 Chromelume

An industrial finish consisting of a ready mixed aluminum, to be known as "No. 1 Chromelume," has been placed on the market by Tousey Varnish Co., 520 West 25th St., Chicago, Ill. This varnish is said to have extreme brilliance and is designed for finishing metal surfaces. The finish will air dry in 15 minutes and, according to the manufacturer, will not rub off after aging.

No. 1 Chromelume can be dipped, sprayed, or flow coated. It will retain its elasticity and remarkable luster and will not powder. No. 1 Chromelume can be used for finishing products such as office equipment, cabinets, machinery, instruments, and metal vaults.

GuildSander Type G-3

The Syracuse GuildTool Co., Syracuse, N. Y., announces the addition of a portable electric sander using standard 3 x 24-in. abrasive belts to its line of products. With a belt speed of 1,350 ft. per minute, this tool, designated as the

GuildSander Type G-3

"INDIAN BRAND"
Turkish and Naxos Emery
Made only from select grades of ore—accurately graded and thoroughly cleaned. Prompt shipment on every order. Cuts cleaner—cuts faster.
Write for trial lot.
HAMILTON
EMERY & CORUNDUM CO.
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"HECCO BRAND"
American Emery

GuildSander Type G-3, is said to speed up sanding and surfacing operations on wood, metal, marble, slate, plastics, and other composition materials. It is equipped with a ½-h.p. universal motor and can be operated on any 110-volt a.c. or d.c. line. The sander can also be supplied for other voltage requirements.

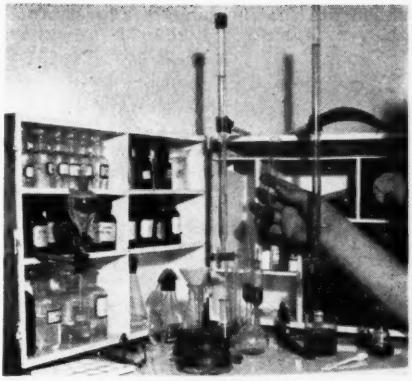
The GuildSander Type G-3 is balanced, compactly built, and easy to handle. All moving parts, including the drive and idler pulleys, are equipped with precision ball bearings. A patented belt aligning control on the sander is said to insure perfect belt traction regardless of motion used. In addition, the sander features a patented quick belt change latch which, it is claimed, cannot stick.

Light in weight (15 lbs.), the GuildSander Type G-3 is said to operate efficiently on both bench and holding jobs as well as on new work or in removing old finishes, interior or exterior. The frame is sturdily cast of aluminum alloy and has a highly polished mirror-like finish.

Portable Chemical Laboratory

The portable chemical laboratory shown in the accompanying illustration is designed for application of accurate chemical analysis on a small scale to the field of electroplating. This portable laboratory was designed by Joseph B. Kushner, 126 W. 32nd St., New York City, for the purpose of rendering electroplating and finishing departments with a complete, prompt field service.

The portable laboratory, which looks something like a valise when closed, contains a full array of testing and chemical equipment such as burettes, pipettes, standard chemical solutions and reagents. Heat is applied by alcohol burners. When closed and fully loaded, the portable laboratory measures 18 in. long by 8 in. deep by 12 in. high and weighs only 20 lbs.

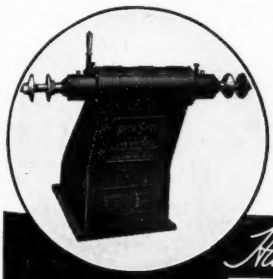


Portable Chemical Laboratory

By means of the portable laboratory, all types of plating tests can be performed, such as analyses of plating solutions, thickness determinations, pH, efficiency testing, throwing power, and so on.

Jackson Folding Eyeshield

An eyeshield of light weight, folding design has been announced by the Jackson Electrode Holder Co., Detroit, Mich. The shield is recommended particularly for workmen engaged in buffing, polishing, and light grinding operations and woodworking, as well as for helpers around spot, flash, and gun welding machines.



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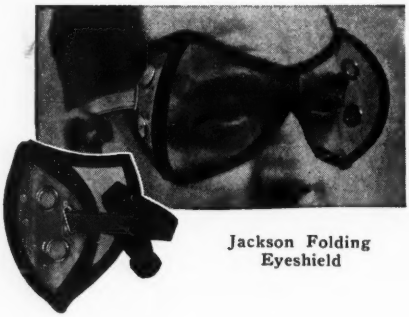
POLISHING LATHES ★ . . . Ask for Catalog No. 10.

AUTOMATICS ★ . . . Rotary and Strait-Line. Send samples for prices and approximate production figures.

Hammond Machinery Builders INCORPORATED
NEW YORK 1622 Douglas Ave., KALAMAZOO, MICH. CHICAGO

According to the manufacturer, the shield fits the face snugly and comfortably, provides complete eye protection,



Jackson Folding Eyeshield

and does not interfere with prescription glasses. Wide vision is afforded in all directions through lenses of flexible, shatterproof Plastacele, and ventilation is provided through screened grommets. The shield can be folded flat and is designed to fit the vest pocket.

THE ADIRONDACKS GORE MOUNTAIN CRYSTAL GARNET ORE

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World's Standard for Over 60 Years

FOR

Abrasive Paper and Cloth
Grinding Wheels
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Lithographing
Non-Skid Surfaces
Wearing Surfaces
Ornamental Purposes
Minus 300 Mesh For Polishing

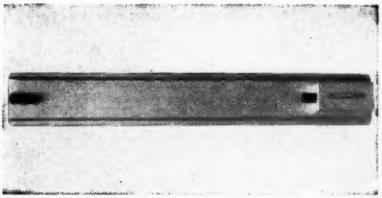
BARTON MINES CORPORATION

NORTH CREEK, WARREN COUNTY, N. Y.

Westinghouse Drying Lamps

Four infrared drying lamps in 250- to 1,000-watt sizes, designed for industrial and commercial drying and heating jobs, have been placed on the market by Westinghouse Lamp Division, Bloomfield, N. J. The infrared drying lamp line includes a 250-watt lamp with pear-shaped clear glass bulb and medium screw base; a 250-watt reflector drying lamp with an inside-frosted bulb, also with medium screw base; and 500- and 1,000-watt lamps in clear glass, globular bulbs, both with medium bipost bases, for heavy duty work. All are designed for use on 105- to 120-volt circuits.

The reflector drying lamp is a self-contained lamp and reflector, incorporating a metallic reflecting coating which is applied to the inside of a specially shaped blown glass bulb, then hermetically sealed in the bulb. In this manner, the reflector is protected from dust, dirt, moisture, and deterioration.



Westinghouse Drying Lamp

The rated laboratory life of all drying lamps is said to be in excess of 5,000 hours. Westinghouse Infrared Drying Lamps can be used for many heating and drying operations including the drying of enamels, lacquers, and paints.

DeVilbiss NCB Spray Painting Unit

A line of small spray painting outfits of streamline design, to be known as the "NCB," is announced by The DeVilbiss Company, Toledo, Ohio. The line includes five different spray equipment assemblies each of which is built around a ¼-h.p. electric, motor-driven, air compressing unit. Three of the assemblies are of the cup-gun type while the other two include a pressure feed paint tank of 2-gal. capacity.

The air compressing unit consists of

a ball bearing, piston type compressor which is direct connected to a standard ¼-h.p. motor. This motor and compressor together with an air strainer, crankcase, and pulsation chamber form an integral unit that is enclosed in a streamlined housing. The exterior surface of the housing is attractively finished in two-color crystaline.

According to the manufacturer the DeVilbiss NCB Spray Painting Outfit is expected to fill a long felt need wherever small spray painting equipment can be used to advantage. This outfit has a rated displacement of 4.3 cu. ft. of air per minute at 40 lbs. pressure. Actual air delivered at this pressure is 2.6 c.f.m. The NCB outfit has a maximum pressure of 50 lbs. and is said to perform consistently without breakdown or repair. It is compact in design, light in weight, and can be easily

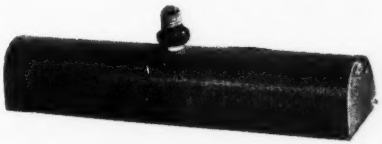
DeVilbiss NCB Spray Painting Unit

carried. In addition, the outfit is provided with four rubber feet to eliminate vibration and crawl. The NCB spray painting outfit shown in the illustration includes a pressure feed spray gun with one-quart cup and 12 ft. of ¼-in. braid covered air hose.

Van Dyke Fluorescent Lighting Fixture

Van Dyke Industries, 2900 S. Halsted St., Chicago, Ill., are now marketing a socket type, fluorescent lighting fixture to be known as the No. 3001. This lighting fixture is suggested for use where detection of imperfections in work, and discrimination of colors is desirable.

The No. 3001 fluorescent lighting fixture can be screwed into a standard socket as easily as inserting a light bulb. The unit is supplied for A.C. only. The standard finish on the light unit is



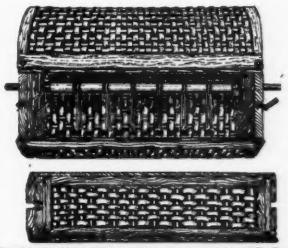
Van Dyke Fluorescent Lighting Fixture

Van Dyke Morocco brown. The unit is made in various lengths and for one or two lighting tubes.

Roe Buffing Machine

Lewis Roe Mfg. Co., 1050 DeKalb Ave., Brooklyn, N. Y., has placed on the market a buffing machine designed for light buffing and coloring. The machine consists of head and stand and is driven by ¼ h.p. A.C. or D.C. motor which is mounted on a stand.

KING



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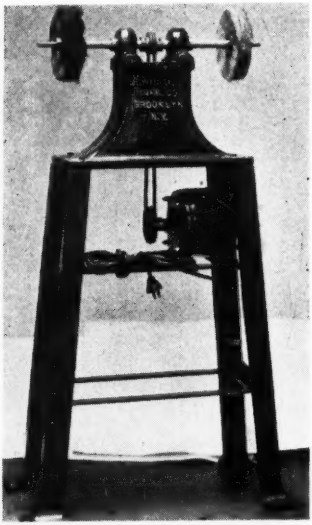
The Roe Buffing Machine is equipped with two self-aligning ball bearings and has a ¾-in. spindle 22 in. long. Longer spindles are available for special appli-



Roe Buffing Machine

cations. The spindles are turned down at the ends to ½ in. and threaded eight square threads to the inch. The ends of the spindle are tapped for taper points which are furnished with the machine.

A V belt and a device for keeping the belt at a uniform tension is also furnish as standard equipment. The machine weighs approximately 100 pounds.

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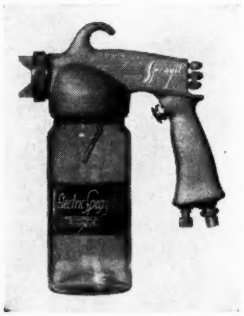
Sprayit Model FL Flock Spray Gun

The Electric Sprayit Co., 1415 Illinois St., Sheboygan, Wis., has placed on the market a flock spray gun to be known as the Sprayit Model "FL." This unit is said to provide the means of applying flock material.

The flock consists of finely cut rayon, cotton, or wool, which, when sprayed on any surface through the Model FL Flock Gun, is said to produce a velour or suede-like finish. Flock can be used for application on novelties, trays, and other items where the use of this interesting material leads to unusual designs, better production and lower cost.

The Sprayit Model FL Flock Gun is made of aluminum alloy and, consequently, is light in weight. It is equipped with a comfortable revolver grip which is said to be extremely easy to handle. All controls are located at the back of the gun, and the full range of adjustments, including changing from round to fan spray without adjusting the nozzle, permits the handling with ease of any grade or quality of flock, as well as glow beads or other types of powders. An important and desirable feature of the Model FL Flock Gun is said to be the location of an oil and moisture filter in the handle of the gun, thus eliminating any possibility of dampening the flock, which might cause it



Sprayit Model FL Flock Spray Gun

to become lump and clog the nozzle. The Model FL Flock Spray Gun can be operated successfully on the Sprayit Series 500, 600, or larger portable compressors, or any air line.

Flock is applied after a coat of sizing material has been applied to the surface by means of any regular Sprayit paint spray gun. The flock is sprayed on immediately, while the sizing is still sticky.

Sprayit Model FL Flock Gun is available complete with one-quart glass jar.

DeBothezat Ventilator

A power, roof ventilator is now being marketed by the DeBothezat Ventilating Equipment Division of American Machine and Metals, Inc., East Moline, Ill. This unit is said to provide positive ventilation at all times independent of all weather conditions.

The ventilator, known as the power-flow roof ventilator, is said to offer a large volume of air per horsepower while maintaining low tip speeds. Quieter operation and increased efficiency are said to be obtained. Special aerodynamical design of the fan blades assures uniform velocity of air over the entire working face of the fan. Non-overloading power characteristics protect the fans against burned out motors.

Entrance eddy losses are reduced to a minimum by a patented "Log Cone" entrance ring. This is said to permit free entrance of air to the fan blades for expulsion.

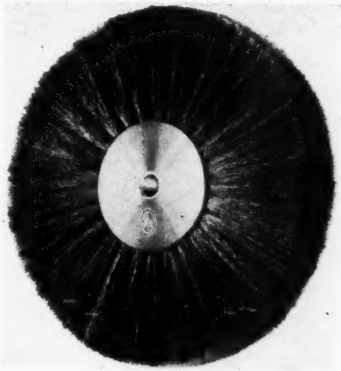
The DeBothezat roof ventilators are available in a wide range of sizes and capacities.

Hanson-Van Winkle-Munning Scratch Brush

A scratch brush designated as "Metl-Hub" brush is now being marketed by Hanson-Van Winkle-Munning Co., Matawan, New Jersey.

The Metl-Hub brush has a one-piece circular metal hub of light weight alloy metal. According to the manufacturer, this hub will not warp, split, or check. The face of the hub permits the drilling of holes for the brush tufts close to the edge of the block, thus eliminating most of the projecting shoulder and lessening the danger of the operator striking the work against the shoulder. The metal hub is of small size and due to its strength is said to permit the use of oversize arbor hole. This type of hub is said to always be in perfect balance, thus reducing power costs, vibration, and wear on the spindles and motors.

The holes for the tufts are automatically spaced, drilled and countersunk



Hanson-Van Winkle-Munning Scratch Brush

by machine to give the tuft a firm seat in the metal block. The holes are said

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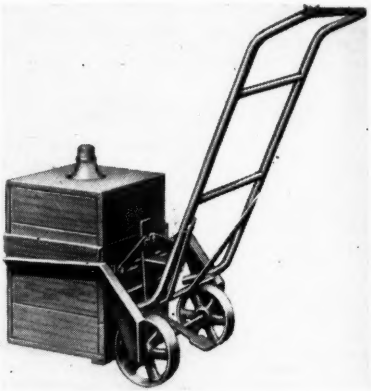
to have no sharp edges which will cut the tuft.

The tuft holes are set close together, thus reducing the space between the tufts and the rows of tufts, which results in more continuous scratching and polishing action. Permanently tight tufts are assured by use of drawing wire of high tensile strength wedged individually into the sides of the holes. The Metl-Hub brush is designed to handle all types of wet work, since there is no danger of warping or splitting the hub. The brush is available in all diameters with any number of rows and in a variety of hub and arbor hole sizes. Steel, brass, and nickel silver wire of all sizes may be used, as well as Tampico bristle and hair.

Barrett-Cravens Carboy Truck

Designed to facilitate the handling of acids and caustics, the carboy truck shown in the illustration has been brought out by the Barrett-Cravens Co., 3255 W. 30th St., Chicago, Ill. The truck is provided with two arms which can be spread apart by means of pressure on a readily accessible foot pedal and which are closed against the crate housing the carboy when the pedal is released. In use, the arms are raised against the cleats on either side of the crate, thereby lifting the crate from the floor and at the same time holding it firmly for transporting. With the truck, one man is said to readily handle full or empty carboys.

The Barrett-Cravens Carboy Truck features a welded steel construction



Barrett-Cravens Carboy Truck

throughout with rigidly reinforced tubular steel handles. It is light in weight, occupies a minimum of floor space, and is said to be easily maneuvered even over rough floors.

Truflo Aluminum Alloy Wall Fan

The Truflo Fan Co., 536 Main St., Harmony, Pa., announces two series of wall fans of aluminum alloy construction ranging in diameters from 12 to 36 in. and from 42 to 48 in., and employing four and six-blade propellers respectively. Motors range from 1/40 to 7½ h.p. with a maximum capacity of 40,000 cu. ft. of air per minute.

Illustrated herewith is a 30-in. diameter four-blade propeller fan commonly used for exhaust purposes. When desired, this fan can be supplied with a guard and automatic shutters. The

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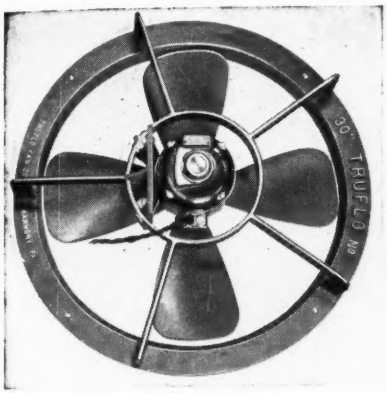
frame and propeller blades are of high tensile aluminum alloy and each is cast in one piece. Such construction is said to permit proper balance at high



Truflo 30-In. Diameter Four-Blade Propeller Fan

speeds, thus reducing excessive weight on the motor shaft and ensuring as nearly as possible perfect running balance. This principle of construction is also said to eliminate power loss and to increase air velocity. The wheel is mounted directly on the motor shaft.

Truflo Aluminum Alloy Wall Fans can be designed for any available current. Motors are available for single and variable speeds with horizontal or vertical mountings. Speeds of the larger fans range from 340 to 860 r.p.m. and those of the smaller fans from 715 to 1,750 r.p.m.

Gyromix Mixer

The Mixing Machine Co., 500 Taylor Bldg., Rochester, N. Y., has placed on the market an industrial and laboratory mixing unit to be known as the "Gyromix." The Gyro mixing machine is said to be a precision type unit which thoroughly mixes materials in a minimum time at a minimum cost. It is especially designed to twist a fast stream of material through the mix against the bottom and sides of the tank. As the fast stream circulates back through the mix, it is intercepted by a larger, slower stream twisting in the opposite direction. In this manner, two currents moving at different speeds in different directions are continually circulating within the tank.

Gyromix horizontal units are designed and built in 1/12 h.p. laboratory size up to 50 h.p. commercial units. The vertical units are designed and built in 1/12 h.p. laboratory size up to 10 h.p. commercial units.

Vitra-Carlite Hammerkraft and Vitra-Carlite Spatter

Two finishes, to be known as Vitra-Carlite Hammerkraft and Vitra-Carlite Spatter, have been placed on the market by Hilo Varnish Corp., 42-60 Stewart Ave., Brooklyn, N. Y. These finishes are said to be designed for use where beauty and durability are prime requisites, such as on circulatory heaters, coal and oil furnaces, hot water heaters, stove shells, and so on. Both finishes are said to have excellent adhesion, heat resistance, and toughness. The

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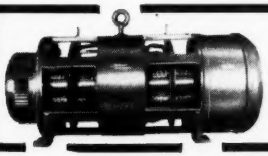
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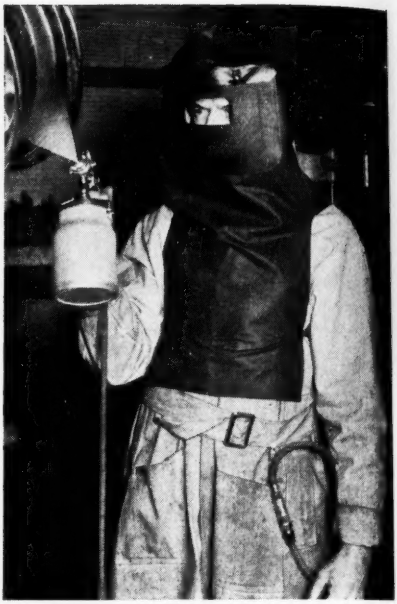
hammered and spatter effects require but two spray operations and only one bake. The length of baking is 20 minutes at 300 deg. F.

Jackson Paint Spray Hood

Workmen engaged in paint spraying operations are said to be provided with ample protection by means of a spraying hood which is now being marketed by Jackson Electrode Holder Co., 15118 Mack Ave., Detroit, Mich. The hood is a tailored, black, rubberized fabric, with a comfortable headgear equipped with an extra wide sweatband.

Air supply for the hood can be conducted from the plant air line through a flexible hose attached to the operator's belt. Twenty-four vents permit fresh air to issue in a cascade over the operator's face and out through a clear opening in front of his eyes. The air flow sweeps fumes and dust away from the operator.

The opening of the Jackson hood is cut in a black fibre unit which can be easily removed from the hood and replaced by a similar unit having a standard 6½ x 9¾ in. clear plastacele window. The window unit can be used when protection from dust is desired. The entire assembly is light and comfortable and a quick acting attachment provides an easy method for connecting the air supply hose to a plant air line.



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Titchener Knitted Wire Tubing

High electrical resistance and high tensile, compression, and torsional strength are among the features of a knitted wire tubing now being marketed by E. H. Titchener & Co., Walnut St. and Erie R.R., Binghamton, N. Y. This tubing consists of rows of resilient wire loops which are interlocked with other rows to form a continuous seamless tube. This interlocking or knitting process is with only one strand of wire. Wire of varying gauges can be used and the tubing can be manufactured in many diameters and in practically any length.

According to the manufacturer, one combination of wire gauge, mesh size,

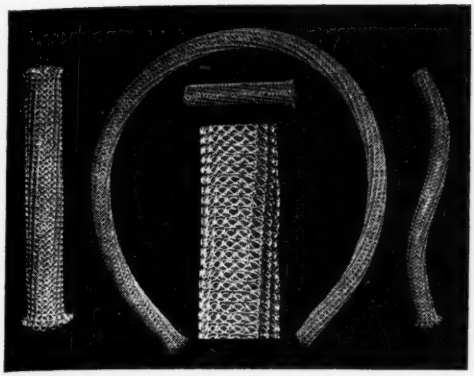

Illustration Showing Several Sizes of Titchener Knitted Wire

and diameter will produce a tube of great flexibility while another combination will make a tube of rigid construction which, when bent or formed, will retain any desired shape or position. Whether a flexible tube or rigid tube is made, both are said to possess the same resistance to deformation.

The manufacturer states that knitted wire can be plated, rust-proofed, enameled, or coated as readily as any other bright steel product and can be covered with rubber, silk, or fabric. Due to its unique and unusual appearance, the knitted wire tubing is said to find wide application in the decorative and display fields. In applications of this type, the tubing is used mainly with bright chrome and nickel finishes. Titchener Knitted Tubing can also be used as a protective covering for hose and hose connections and for light cords on electrical appliances; as a wire covering for moving parts in machinery, for flexible shafts or belt drives; or as a non-slip grip for tool handles, brooms, brushes, and so on.

Quincy Light Weight Air Compressor

To meet the demand for a compact, light weight air compressor suitable for low pressure service, the Quincy Compressor Co., Quincy, Ill., has brought out an improved single stage compressor of the types shown herewith. This compressor is built in two models designated as the X-2 and X-8.

Model X-2 is a single stage, single cylinder compressor weighing only 15 lbs. and is designed for piston displacements up to 2.8 c.f.m. at a maximum speed of 875 r.p.m. Model X-8 is a single stage, duplex cylinder compressor and weighs 31 lbs. It has a piston displacement of 8.7 c.f.m. at maximum speed. The cylinders and crankcases on both models are cast in one piece, thus eliminating excess weight and simplifying construction.

The Quincy Light Weight Air Compressor incorporates many of the mechanical features found on the larger air cooled compressors in the Quincy line. The crankshaft is a drop forging from 1035 SAE heat-treated steel, balanced perfectly with integral counterweights. Aluminum alloy connecting rods are standard equipment. The

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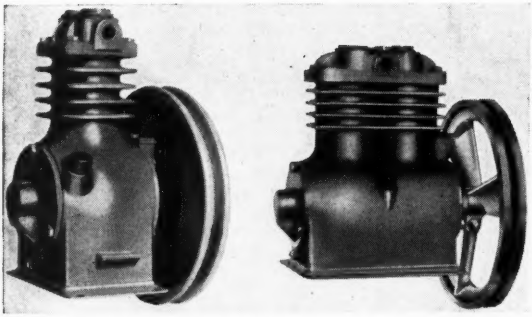

(Left) Model X-2 is a single stage, single cylinder compressor. (Right) Model X-8 is a single stage, duplex cylinder compressor.

crankcase is totally-enclosed and dust-proof, and lubrication is of constant level splash type. Cooling is accomplished by means of deep horizontal fins on the cylinder.

The compressor is equipped with disc type, clock spring steel valves which are mounted in the head. Each valve can be removed individually for inspection without disturbing the other valves. Pistons of the compressor are of alloy iron fitted with two compression rings and one oil control ring. The main bearings are made of hard rolled bronze. Where suction valve unloading for continuous pressure service is required, a Quincy VD unloader can be supplied.

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Baertex Floor and Dado Enamel

An abrasion-resisting, synthetic enamel for interior use on concrete floors, to be known as Baertex Floor and Dado Enamel, has been placed on the market by Baer Brothers, 438 W. 37th St., New York City. This finishing material is available in battleship gray and in a variety of 21 other colors.

Baertex Floor and Dado Enamel is recommended for any interior surface where a glossy, long-wearing, overnight-drying finish is desired. This finishing material is said to have an average covering power of 600 to 700 sq. ft. per gallon. It is also said to have remarkable resistance to abrasion.

Baertex Floor and Dado Enamel

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